July 1954

MECHANICAL ENGINEERING

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ASME Fall Meeting, Milwaukee, Wis.
September 8-10, 1954

This Bailey Boiler Control Panel insures high efficiency in the use of Fuel-Dollars at a Western Chemical Plant.

What's Your Fuel-dollar Efficiency?

A dollar's worth of fuel has the *same potential* energy, no matter who's boiler it fires. But how much of the energy actually gets converted to a usable form depends on how you operate your boiler.

That's where Bailey Controls can help. And, here's why, we believe, you'll get better fuel-dollar efficiency with Bailey:

1. **Complete Range of Equipment—fully co-ordinated.** You need never worry that a Bailey Engineer's recommendation is slanted in favor of a particular type of equipment, just because he has a limited line to sell—or that Bailey will pass the buck for efficient control; we offer *complete* boiler control systems.

2. **Engineering Service—backed by experience.** No other manufacturer of instruments and controls can offer as broad an experience, based on successful installations involving all types of combustion, flow measurement and automatic control.

3. **Direct Sales-Service—conveniently located near you.** Bailey Meter Company's Sales-Service Engineers are located in more industrial centers than those of any other manufacturer of boiler control systems; you get prompt, experienced service with a minimum of travel time and expense.

•

For better fuel-dollar efficiency—for more power per fuel-dollar, less outage and safer working conditions, you owe it to yourself to investigate Bailey Controls. Ask a Bailey Engineer to arrange a visit to a nearby Bailey installation. We're proud to stand on our record: "More power to you!"

A-109-1

BAILEY METERS

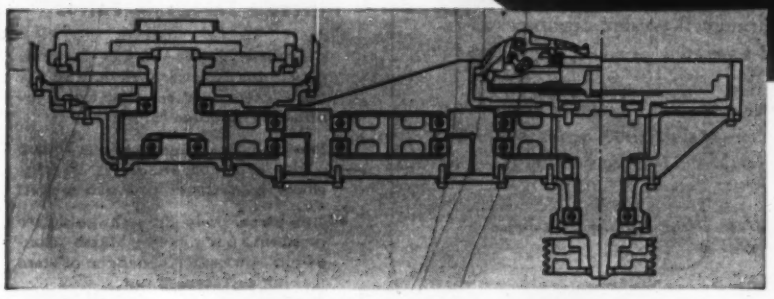
BAILEY METER COMPANY

1026 IVANHOE ROAD
CLEVELAND 10, OHIO

Controls

NEW DEPART
at work in Dart's new monster

This dual-engine giant has two torque converters, two transfer cases and two reverse gear boxes in which New Departure applications are found. Cross section of transfer case shows seven **ball** bearings—all New Departures!

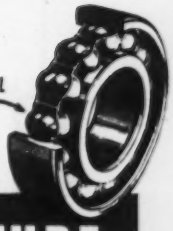


Weight—50 tons! Payload—75 tons! It's Dart's mighty Monster, world's biggest truck; yet it's agile, too. Here's where New Departure **ball** bearings carry the loads . . . in the transfer cases, reversing gears and torque converters that deliver a 700-horsepower drive to tandem rear axles.

Whatever the load . . . radial, thrust or any combination . . . New Departure **ball** bearings mean precision performance. They maintain accurate positioning of gears and shafts . . . reduce wear and maintenance to the minimum.

Learn what *ball* bearings can do for *your* product . . . talk to your New Departure engineer—soon!

NOTHING ROLLS LIKE A BALL



NEW DEPARTURE
BALL BEARINGS

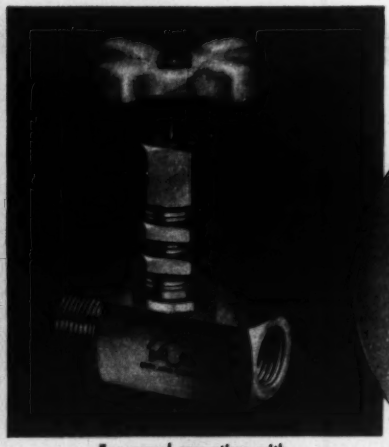
NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONNECTICUT
Plants also in Meriden, Connecticut and Sandusky, Ohio
In Canada: McKinnon Industries, Ltd., St. Catharines, Ontario

NEW DEPARTURE SALES ENGINEERING OFFICES—AT YOUR SERVICE

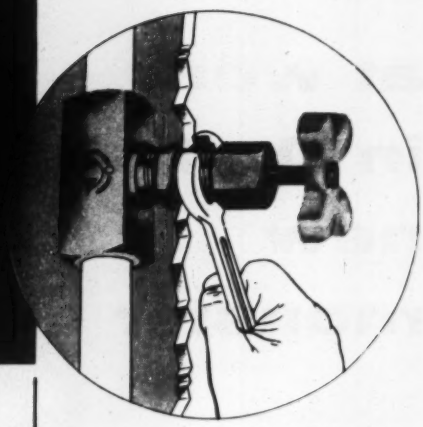
BRISTOL	269 North Main St.	2-6371	**DETROIT**	7-122 General Motors Bldg.	Trinity 2-4700	**KANSAS CITY**	1021 E. Linwood Blvd.	Valentine 4939
BOSTON	517-A Park Square Bldg.	Hancock 6-9867	**CINCINNATI**	2107 Carew Tower	Main 5783	**MILWAUKEE**	647 W. Virginia St.	Broadway 6-9460
KANNAPOLIS, N. C.	P. O. Box 1086	2-3181	**CLEVELAND**	3113 W. 110th St.	Winston 1-5454	**ST. LOUIS**	3001 Washington Blvd.	Franklin 6533
NEW YORK	1775 Broadway	Circle 6-1540	**INDIANAPOLIS**	1357 W. 18th St.	Imperial 4680	**LOS ANGELES**	5035 Gifford Ave.	Logan 8-2301
PHILADELPHIA	850 E. Luzerne St.	Garfield 3-4136	**PITTSBURGH**	Cathedral Mansions	Mayflower 1-8100	**BERKELEY**	1716 Fourth St.	Landscape 6-8750
SYRACUSE	2360 James St.	73-5195	**CHICAGO**	332 So. Mich. Ave.	Wabash 2-5875	**SEATTLE**	5000 First Ave., S.	Lander 5920
			DAVENPORT	2212 E. 12th St.	Davenport 7-7522			

MECHANICAL ENGINEERING, July, 1954, Vol. 76, No. 7. Published monthly by The American Society of Mechanical Engineers, at 20th and Northampton Sts., Easton, Pa. Editorial and Advertising departments, 29 West 39th St., New York 18, N. Y. Price to members and affiliates one year $3.50, single copy 50¢; to nonmembers one year $7.00, single copy 75¢. Postage to Canada, 75¢ additional, to foreign countries $1.50 additional. Entered as second-class matter December 21, 1920, at the Post Office at Easton, Pa., under the Act of March 3, 1879. Member of the Audit Bureau of Circulations.

For panel mounting with double female connections.



For panel mounting with male inlet; female outlet.



A quick, trim panel mounting with a twist of a wrench.

Panel mounted in seconds!

Did you know that the best needle valve is also best for panel mounting?

Look at the valves above . . . specifically designed for panel mounting. No holding fixtures are needed. Simply remove the packing nut and one of the holding nuts; slip the stem through the panel opening and reassemble. The valve handle is packed separately to speed up the job — literally done in seconds.

You get a neater installation at lower cost . . . just one more proof that we have thought of everything in the Marsh 1900 series. Note the unduplicated features opposite. Ask for Needle Valve Catalog covering all details.

MARSH INSTRUMENT CO., *Sales affiliate of Jas. P. Marsh Corporation*
Dept. 29, Skokie, Ill.

MARSH *Needle Valves*

Standard globe pattern with double female connections.

Standard globe pattern with male inlet; female outlet.

Standard angle pattern with double female connections.

Standard angle pattern with male inlet; female outlet.

MARSH

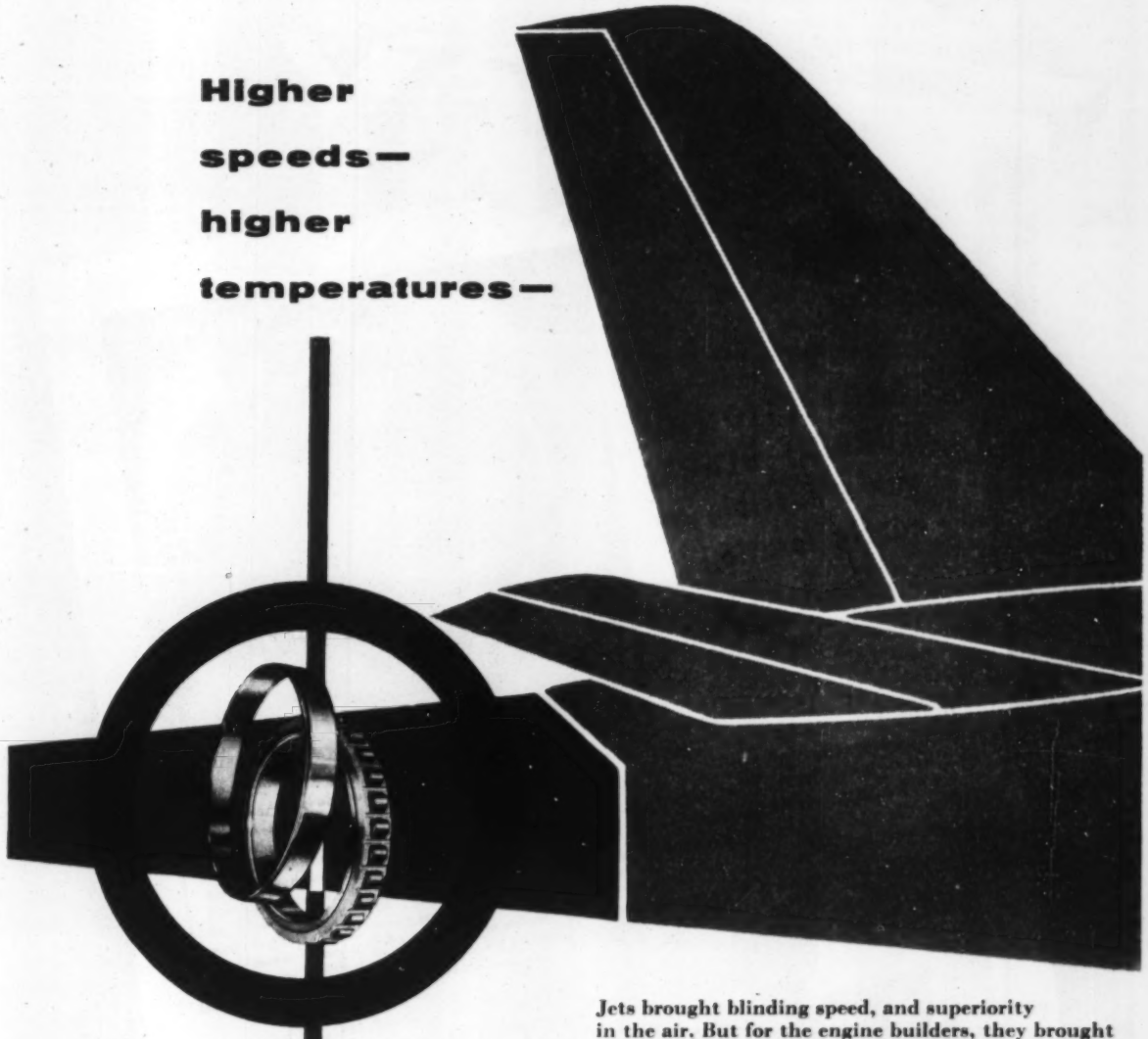
The ultimate in Needle Throttling Valves

All Marsh Needle Valves — for both panel and standard mounting — share these features that are combined in no other valves.

- **Maximum working pressure: 10,000 psi** — for water, oil, or gas. Equally effective in lower pressure ranges.
- **One piece.** Body and stem-guide are fused into one piece by Marsh "Conoweld" process. No danger of stem leaking or blowing out.
- **Precision machined and ground stem** —of 416 stainless steel. Easier to operate at higher pressures.
- **Finer regulation**—provided by long fine stem threads which also give added strength.
- **Machined from heavy bar stock**— Both body and stem-guide. Sturdiest basic construction known.
- **Deep "Marpak" packing**—longer lasting; easier to renew.
- **Deep throats and thread chambers** —for tight make-up of piping.
- **Handsome appearance**—Electro zinc plated body, set off by sturdy malleable iron handle finished in heavy, attractive, yellow baked enamel.
- **Clear markings.** Bodies marked in accordance with M.S.S. regulations showing size, material, service symbol, maximum pressure.

The standard series is shown opposite.

Higher speeds— higher temperatures—



HYATT BEARINGS!

Jets brought blinding speed, and superiority in the air. But for the engine builders, they brought problems. With higher speeds came higher operating temperatures, and engine parts, especially bearings, had to be designed to withstand destructive heat. So designers turned to Hyatt. With unexcelled research and development facilities, modern production equipment, and years of experience, Hyatt was a logical choice. Hyatt know-how assured highest quality in mass production, and since 1944 Hyatt has been a major supplier of jet bearings. When design requirements are beyond the capabilities of ordinary bearings, always call on Hyatt.

Partial list of aircraft equipped with turbo-prop and turbo-jet engines using Hyatt Bearings:

Bell X-5 Research Monoplane
Boeing XB-47C Air Force Medium Bomber
Consolidated—Vultee Model 7002 (XF-92A)
Consolidated—Vultee Turboliner
Douglas XA2D-1 "Skyshark" Navy Attack Bomber
Grumman F9F "Panther" Navy Fighter Plane
Lockheed F-80C "Shooting Star" Fighter Plane
Lockheed F-94A & B Air Force Fighter Plane
Lockheed TO-1 U.S. Navy Version of the F-80G For Use as Jet Trainer
Martin P4M-1 Long Range Navy Patrol Bomber
Martin B-57A U.S. Air Force Version of the English Electric Canberra Medium Bomber
North American AJ-1 "Savage" Navy Carrier Attack and Search Airplane
Northrop F-89A All Weather Fighter Plane
Northrop YRB-49A "Flying Wing" Heavy Bomber
Republic F84F "Thunderjet" Fighter Plane

HYATT

STRAIGHT BARREL TAPER

HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION • HARRISON, N. J.

TERRY

PROTECTION OF TURBINE BLADES made possible by nozzle location

The Terry Solid-wheel Turbine is of the impulse, helical flow type. The steam issues from an expanding nozzle at high velocity and enters the wheel bucket where its direction is reversed 180°. As this single reversal uses but a portion of the available energy, the steam is returned to the wheel several times until practically all of the energy has been utilized. This principle makes possible the efficient use of steam in a single-piece, almost indestructible wheel.

In the Terry Solid-wheel Turbine, the steam enters the buckets in a direction at right angles to the shaft, as shown above. This design eliminates the need for close clearances and provides positive blade protection.

The blades cannot foul. There is a one inch clearance on either side of the wheel. In addition, projecting rims on each side of the buckets prevent damage to the blades even though external thrust should move the wheel.

This is only one of the many important features of the Terry Solid-wheel Turbine. Write for complete details.

THE TERRY STEAM TURBINE CO.
TERRY SQUARE, HARTFORD 1, CONN.

TT-1195

Memo

Send for a copy of bulletin S-116 which describes the many advantages of the Terry Solid-wheel Turbine.

How Servel Water Chillers

Solve your Cooling Problem

1

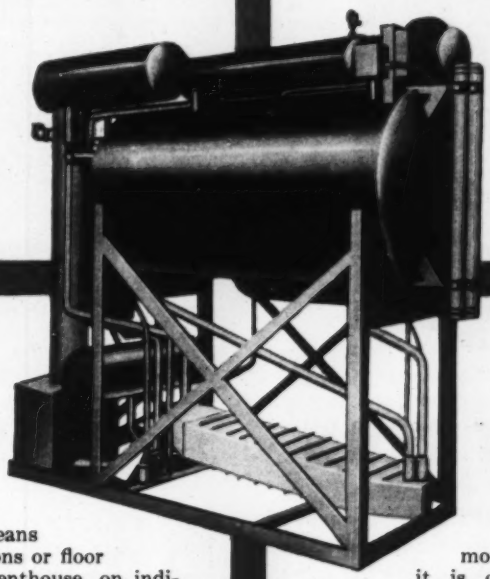
Regardless of cooling needs

The adaptable Servel 25-ton Water Chiller uses water as the refrigerant—provides economical cooling for *air conditioning, process cooling,* or *industrial pre-cooling.* Your Servel dealer can show you performance figures on applications most similar to your needs, in any of the three fields.

2

With the most economical fuel

Steam from the most economical source—gas, oil, LP gas, even *waste* heat—operates the unit, by Servel's exclusive, no-moving-parts *absorption* principle of refrigeration. This wide choice assures you of low operating costs . . . as does Servel's high operating efficiency.



3

Under every installation situation

Light floor loading and vibrationless operation means that no special foundations or floor braces are needed—in penthouse, on individual floors, or in basement. Simple piping, instead of expensive duct work, cuts installation time and costs. Zone control is unusually easy.

4

With exclusive assurance of satisfaction

The Servel Water Chiller cooling system has no moving parts to wear, thus it is quiet and vibration-free. Every Servel Water Chiller is backed by a 5-year warranty. See your Servel dealer or mail coupon for information and engineering co-operation.

MAIL NOW FOR COMPLETE DETAILS!

Servel

the name to watch for great advances in

AIR CONDITIONING ✓ REFRIGERATION

SERVEL, INC., Dept. ME-74, Evansville 20, Indiana

Please send me complete information on Servel equipment for ☐ Air Conditioning, ☐ Process Cooling, ☐ Industrial Precooling.

Name_____

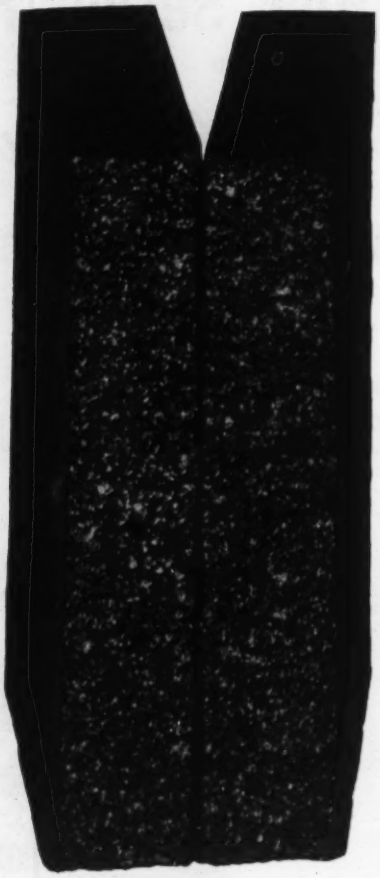
Firm_____

Address_____

City_____ County_____ State_____

HERE IS THE DIFFERENCE

WROUGHT IRON



STEEL

These are actual photographs of fractured pieces of wrought iron and steel. The picture at the left shows the fibrous structure of wrought iron. How this differs from the crystalline structure of steel is readily apparent. It is the presence of many thousands of tiny threads of glass-like iron silicate that gives wrought iron this unique fibrous structure and it is this structural feature, duplicated in no other metal, that gives wrought iron its superior resistance to corrosion and fatigue stresses.

While the initial cost may be higher, actual service records in numerous applications prove that wrought iron is the most economical buy because it lasts longer. Ask any Byers Field Service Engineer to show you fractured pieces, similar to those illustrated above. Write for our booklet, "The ABC's of Wrought Iron."

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. Export Department: New York, N.Y.

BYERS

CORROSION COSTS YOU MORE THAN WROUGHT IRON

WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

ELECTRIC FURNACE QUALITY STEEL PRODUCTS

Protects hydraulic circuits

ACTUAL SIZE

PUMPS • CONTROLS
MOTORS • PRESSES

Denison Surge Damping Valve prevents hydraulic shock... eliminates damage to fittings, lines, seals and equipment

Sudden starting, sudden release of high pressure into a low pressure area, or reversal of flow causes a hydraulic surge as damaging to a circuit as blows from a hammer.

The Denison Surge Damping Valve converts the hydraulic surge into a smooth, gradually accelerated flow of fluid power. A hydraulically unbalanced reaction flow control in the valve causes the valve to open slower as the intensity of the surge increases.

Lightweight and easy to install, the Denison Surge Valve can be used on any circuit up to 5000 psi. Requires no adjustment . . . interferes in no way with the efficiency of the circuit.

The circuit shows a Denison Surge Damping Valve preventing hydraulic shock when stored-up energy in an accumulator is released. For a bulletin on the surge valve, write to: THE DENISON ENGINEERING COMPANY, 1189 Dublin Road, Columbus 16, Ohio.

DENISON Hydr**OIL**ics

One source... for all your

All these requirements can be met with flat-rolled U·S·S CARILLOY steels

	PLATE	STRIP	SHEET
METHODS OF MANUFACTURE			
Electric Furnace	X	X	X
Open Hearth	X	X	X
SPECIAL QUALITIES			
Aircraft	X	X	X
Armor	X		
Bearing	X	X	X
Drawing	X	X	X
Flange and Firebox	X		
Metal Cutting Saw		X	X
Razor Blade		X	X
Other Special Qualities	X	X	X
TREATMENTS INDIVIDUAL OR COMBINED			
Quenched and Tempered	X	X	X
Annealed	X	X	X
Spheroidize Annealed	X	X	X
Normalized	X	X	X
Stress Relieved	X		
	X		
CONDITIONS INDIVIDUAL OR COMBINED			
Hot Rolled	X	X	X
Straight Lengths	X	X	X
Coiled		X	X
Flattened or Leveled	X	X	X
Gas or Special Cutting	X		
Pickled	X	X	X
Sand Blasted	X	X	X
Oiled	X	X	X
Formed, Machined or Other Special Conditions	X		
	X		
SPECIFICATIONS REQUIREMENTS INDIVIDUAL OR COMBINED			
Grain Size	X	X	X
Macro-Etch	X		
Micro-Cleanliness	X	X	X
Restricted Chemical Analysis	X	X	X
Special Mechanical Tests	X		
Impacts	X	X	X
Tensile Tests	X	X	X
Bend Tests	X	X	X
AISI-Govt.-ASTM-SAE	X	X	X
Special Specifications	X	X	X
	X	X	X

alloy steel plate, sheet and strip!

Just specify U·S·S CARILLOY steels

Glance down the accompanying list of qualities, treatments, conditions and specification requirements that can be furnished in U·S·S CARILLOY plate, sheet and strip. This is the widest selection of flat rolled Alloy Steel products you can secure from any one producer. Our unmatched mill flexibility and size range enable you to order anything from a razor blade strip to a plate for a battleship. This streamlines your purchasing, assures consistent quality and simplifies your manufacturing problems. Making United States Steel your source of supply gives you access to *expert metallurgical assistance.*

Any time you have a metallurgical or fabricating problem, call in a United States Steel Service Metallurgist. He has an extensive knowledge of all types of Alloy Steels and can help cut costs by offering suggestions to assist your engineering and production people.

It will pay you to investigate our facilities—submit your inquiries to our nearest sales office, or send the coupon.

UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

3-2093

Carilloy USS Steels

ELECTRIC FURNACE OR OPEN HEARTH

COMPLETE PRODUCTION FACILITIES IN CHICAGO OR PITTSBURGH

United States Steel
Room 4409, 525 William Penn Place
Pittsburgh 30, Pa.

☐ Please send my free copy of your booklet, "STEELS FOR ELEVATED TEMPERATURE SERVICE."

☐ Have your representative call.

Name.....

Company.....

Address.....

City.....State.....

UNITED STATES STEEL

WANTED:

DRY air to protect valuable stock in storage at Kenilworth Steel

SUPPLIED:

By Lectrodryer . . . saves 2 steps in production and speeds shipments

PROBLEM: How may tempered spring steel—bright or colored—be stored in a 30,000 cu. ft. Kenilworth Steel storage area at Kenilworth, New Jersey so as to eliminate greasing and degreasing steps, yet provide maximum protection against corrosion?

SOLUTION: Installed CHR Lectrodryer* which maintains relative humidity of 30% or below. The moisture content of the air is reduced to a harmless level, below where rust could occur.

RESULT: Eliminates costly greasing and degreasing of tempered steel, feeler gauge and shim steel. Faster shipments are possible. Bright steel stays bright and free from corrosion.

What in the World do you want DRY?

There's a type of Lectrodryer to solve just about any moisture problem. Relative humidity control is possible to lower than 10%. Dewpoints may be preset to lower than −100°F. You can reduce the moisture content of air, other gases, and organic liquids, in large and small volumes, to pressures as high as 6,000 psi, with Lectrodryers.

Write for Because Moisture Isn't Pink

This booklet shows the actual use of all types of Lectrodryers, describing how Lectrodryers are the DRYing solution to industry's moisture problems.

Pittsburgh Lectrodryer Corporation, 335 32nd Street, Pittsburgh 30, Pennsylvania.

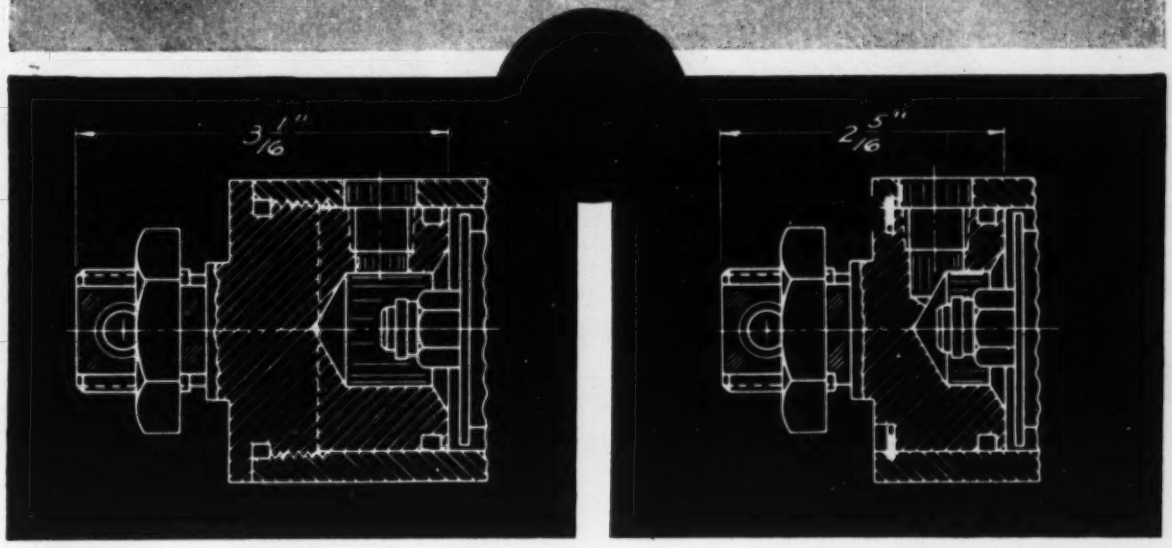
In England: Birlec, Limited, Tyburn Road, Erdington, Birmingham.
In France: Stein et Roubaix, 24 Rue Erlanger, Paris XVI.
In Belgium: S. A. Belge Stein et Roubaix, 320 Rue du Moulin, Bressoux-Liege.

LECTRODRYERS DRY WITH ACTIVATED ALUMINAS

LECTRODRYER

* REGISTERED TRADEMARK U.S. PAT. OFF.

Waldes Truarc Rings Cut Costs $3.26 per Unit, Reduce Size and Weight of Air Cylinder!



OLD STYLE air cylinder, with thread-secured head, required costly tapping, chasing and assembly operations. Also, satisfactory maintenance of packing unit necessitated use of pipe wrenches on painted surfaces.

NEW cylinder head is secured with precision-ground Waldes Truarc Rings. This produces perfect alignment of head within the housing, difficult to obtain with screw-thread seating. Maintenance is quick and easy.

WALDES TRUARC RINGS PERMITTED THESE SAVINGS

Production Time Cut..17 minutes
Weight Saved.....1¾ lb.
Length Shortened.....1½ inches
Cost Saved.....$3.26 unit

■ The A. K. Allen Company of Brooklyn, New York, maker of *AllenAir* cylinders, now uses two Waldes Truarc Inverted Rings (series 5008) to secure heads rigidly within tubes.

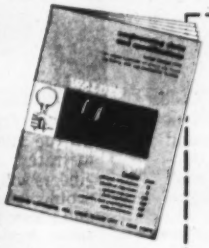
■ TRUARC Rings, in this application, are ground parallel by A. K. Allen to .001 tolerance. In a static hydraulic bursting test, the 3" unit (recommended for 350 p.s.i.) withstands a pressure of 2000 p.s.i. And at bursting-point, the brass groove gives way; the Truarc Ring remains intact.

■ Waldes Truarc Retaining Rings are precision-engineered . . . quick and easy to assemble and to disassemble. They can be used over and over again. There's a Waldes Truarc Ring to answer every fastening problem.

■ Find out what Waldes Truarc Retaining Rings can do for you. Send your blueprints to Waldes Truarc engineers.

For precision internal grooving and undercutting . . . Waldes Truarc Grooving Tool

SEND FOR NEW CATALOG



WALDES TRUARC
REG. U. S. PAT. OFF.
RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

WALDES TRUARC RETAINING RINGS AND PLIERS ARE PROTECTED BY ONE OR MORE OF THE FOLLOWING U. S. PATENTS: 2,382,947; 2,382,948; 2,416,852; 2,420,921; 2,428,341; 2,439,785; 2,441,848; 2,455,165; 2,483,380; 2,483,383; 2,487,802; 2,487,803; 2,491,306; 2,909,091; AND OTHER PATENTS PENDING.

ME 076

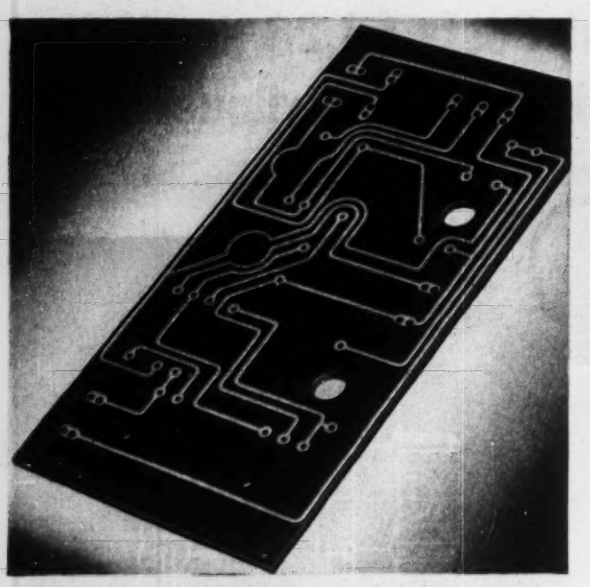
Waldes Kohinoor, Inc., 47-16 Austel Pl., L. I. C. 1, N. Y.

Please send me the new Waldes Truarc Retaining Ring catalog.

(Please print)

Name.....
Title.....
Company.....
Business Address.....
City..... *Zone*..... *State*.....

How would YOU solve these two problems?



1. PRINTED CIRCUITS have become vital in the new, miniaturized electrical and electronic devices. For etching these circuits, temperature of the acid bath must be accurately controlled. The Master Etching Company of Wyncote, Pa., has developed an automatic temperature control unit for this important purpose. The heat element is built into a pyrex tube, while its dependable THERMOSWITCH® is enclosed in flexible plastic tubing. The whole assembly is then encased in an acid-proof container.

2. HOW CAN COMMERCIAL, industrial, hospital and diaper laundries insure continued and better customer satisfaction? One solution is to employ devices using Fenwal THERMOSWITCH units. Henrici HT-1 and -2 Timers accurately control temperatures of washing formulae. Henrici tumbler Door Openers open tumbler doors, protecting goods being dried from scorching. Fenwal THERMOSWITCH units have been used in these devices for over ten years.

3. ARE YOU USING FENWAL THERMOSWITCH CONTROLS to solve your problems? Compact, highly resistant to shock and vibration, these controls have solved a wide range of temperature control problems. Their external, single-metal shell expands or contracts *instantly* with temperature changes, making or breaking enclosed electrical contacts.

4. SEND FOR THIS CATALOG for complete explanation of the unique THERMOSWITCH unit. Also ask for more detailed, illustrated discussions of the problems above. Fenwal engineers will be glad to help you solve your temperature control problems involving heat, humidity, radiant heat, pressure and other variables. **Write Fenwal Incorporated, 57 Pleasant Street, Ashland, Massachusetts.**

Fenwal

THERMOSWITCH®

Electric Temperature Control and Detection Devices

SENSITIVE . . . but only to heat

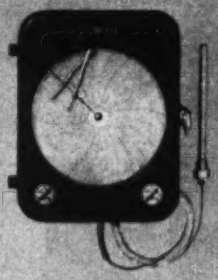
Above: POWERS ACCRITEM Temperature Regulator, is water or compressed air operated. Controls FLOWRITE diaphragm valve (right). Widely used for Water Heaters and Industrial Processes.

POWERS Type H Thermostatic Water Mixers insure utmost comfort and safety in showers and other types of baths.

Also used for many processes. Users report ½° F. ± accuracy. Capacities 5 to 10 gpm. @ 45 psi.

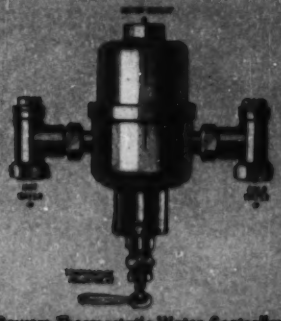
Powers No. 11 Self-Operating Regulator widely used for water storage heaters, heat exchangers, fuel oil preheaters and many industrial processes.

WATER Temperature CONTROL?



Powers Series 100 Recording Controller. Compressed Air Operated.

POWERS FLOWRITE V-Port-Characterized Diaphragm Control Valve.



Powers Thermostatic Water Controller for regulating temperature of multiple type showers, hydro-therapy and industrial processes. Capacities 22 to 123 gpm. @ 45 psi.

Powers Remote Bulb Type D Thermostat for Unit Air Conditioners.

POWERS **PACKLESS** VALVES

For controlling chilled, or heated water in unit air conditioners.
No leakage
No packing maintenance

Call POWERS

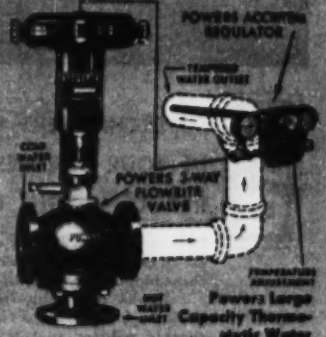
Most Complete Line of Controls Made Only a few are shown here

for All Types of Baths, Water Heaters and Heat Exchangers

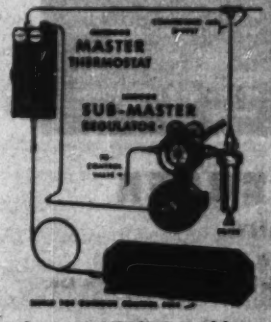
- Forced Hot Water Heating Systems
- Radiant Panel Heating Systems
- Air Conditioning Units using Chilled and Heated Water
- Cooling Water for Air Compressors, Diesel, Gas Engines, and Cyclotrons
- **Many Industrial Processes:** Photo Developing, X-Ray, Color and Ordinary Film, Lens Polishing and Grinding, Chocolate Enrobers, Plastic Molding Presses, etc.

Our More than 60 Years Experience will be valuable in helping you select the right control for your requirements. Contact our nearest office or *Write us direct for Condensed Catalog Rb 24.*

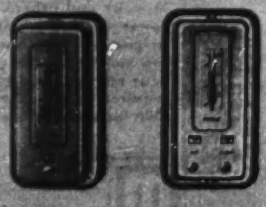
THE POWERS REGULATOR CO.
Skokie, Ill. • Offices in Over 50 Cities in the U.S.A., Canada and Mexico

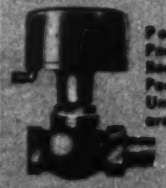


Powers Large Capacity Thermostatic Water Mixing Valve Controlled by an ACCRITEM Temperature Regulator. Capacities 20 to 1200 gpm. @ 45 psi.



Powers MASTROL Control for regulating forced hot water heating systems.





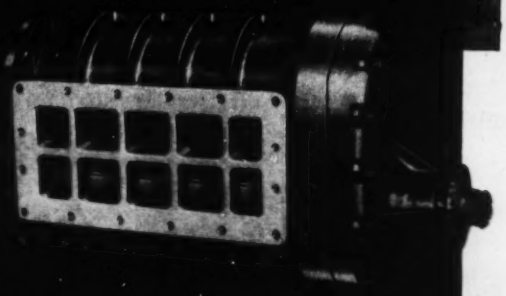
Powers Room Type Pneumatic Controls for Radiant Heating-Cooling Panels, Convectors and Unit Ventilators. Valves are packless. No more packing maintenance. No leakage.

MAKING THE GRADE with Supercharged Power!

SUPERCHARGERS PUT EXTRA OOMPH IN YOUR ENGINES, REDUCE WEIGHT PER HORSEPOWER!

Pulling a 50-ton load of copper ore up an 18% grade from pit to crusher is rough and rugged work for any truck. But these big, fast-moving Diesels take the hill "right in stride" . . . thanks to Miehle-Dexter Supercharged Power. More than that, operators at this Arizona open-pit mine reported sharply reduced maintenance costs and big dividends in fuel economy when they switched to Diesel trucks equipped with Miehle-Dexter Superchargers.

MIEHLE-DEXTER SUPERCHARGERS have won universal acceptance on engines of leading Diesel engine manufacturers, including Buda, Cummins, Fairbanks-Morse, Murphy and others. If you, too, want to boost the horsepower of your engines by *50% or more* . . . and *decrease weight-per-horsepower*, too, call on M-D engineers. They can specify the exact size and type M-D Supercharger for your engines, and you'll find the investment far less than required by any other method. Standard M-D models available for applications from 100 to 750 hp. Write for bulletin.



FOUR FEATURES PROVE MIEHLE-DEXTER SUPERCHARGERS BETTER ON THE JOB

Patented end plate seals eliminate metal-to-metal contact, assure longer life, help achieve fuel savings.

Lightweight aluminum rotors and aluminum case boost engine horsepower, do not add weight, allow high speeds.

Rotor wear strips eliminate contact between rotors and housing, assure longer wear.

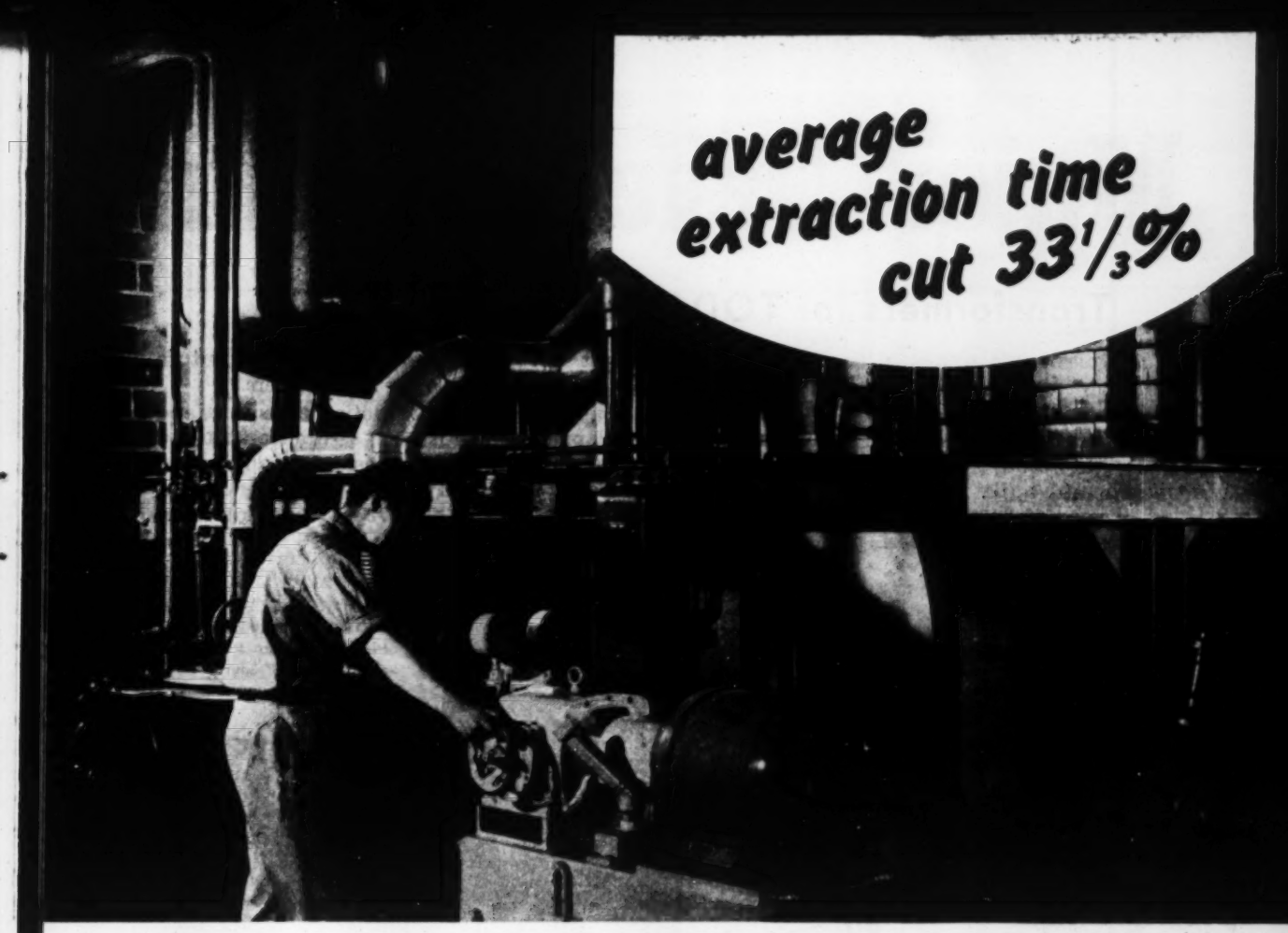
All parts are standardized, allowing easy field service and interchangeability.

MIEHLE-DEXTER SUPERCHARGER

DIVISION OF THE DEXTER FOLDER COMPANY

100 FOURTH STREET • RACINE, WISCONSIN

Trust M-D Superchargers for internal combustion engines . . . use them for blower and air compressor operations, too.



Once more the ANY-SPEED Oilgear Drive betters machine performance "painlessly"

Many times in our experience the performance of an already highly efficient machine has been bettered without redesign, solely by changing the drive. One case out of many *varied* cases, is the Tolhurst Centrifugal pictured above, located in a great pharmaceutical house. This centrifugal was originally equipped with a two-speed electric motor drive. However the chemicals it is called upon to handle have widely varying crystal packing characteristics. Some of these crystals packed so densely at the speed available, extraction was inhibited, extraction time far out of balance and crystal removal difficult.

A change was made to an *"ANY-SPEED"* Oilgear Fluid Power Drive. Now the operator is able to shade the speed of the centrifuge experimentally—*and easily discover* the *best* speed for each batch of crystals.

As a result, extracting that used to take from 6 to 9 hours was cut to 4 to 6 hours. The extremely slow speed also available made unloading a great deal easier. This user now has several other Oilgear drives including one on a laboratory centrifuge.

There is very often a direct efficiency coefficient between machine operating speed and the type of work being handled. And we can cite many widely varying instances where equally dramatic and profitable gains resulted at once from a simple change to *"ANY-SPEED"* Oilgear Fluid Power Drives. If you want some interesting factual data on Oilgear's steplessly variable speed drives, their outstanding responsiveness to control impulses, their smooth acceleration and deceleration, talk to an Oilgear Engineering Representative. His mature and sound engineering recommendations may profit you greatly. THE OILGEAR COMPANY, 1570 W. Pierce St., Milwaukee 4, Wisconsin.

OILGEAR

OILGEAR

Major Developments

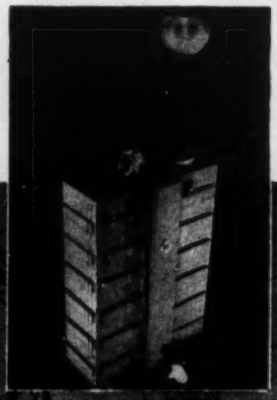
Transformers for TODAY and TOMORROW

TO MEET TODAY'S NEEDS, Allis-Chalmers is building transformers with capacities up to 220,000 kva and others for 345-kv transmission.

To be ready for tomorrow's requirements, and to add to today's design information, A-C designed and built the 600-kv unit shown below. Tested at design levels and then taken up to breakdown, this pioneering unit has been rebuilt and is now available for testing future extra high voltage power transformers.

This combination of practical experience and development work is your assurance that you can depend on A-C for transformers engineered to meet your requirements . . . all, of course, incorporating *corona-free* design for long, trouble-free insulation life. A-4294

At right: Capable of operation on 600-kv transmission line now — possibly on 880-kv line in the future, this 5000-kva commercial-type power transformer proves that Allis-Chalmers transformer engineering is ready for transmission voltages far beyond present levels.



Below: Two 90,000-kva banks of load ratio control transformers on 230-kv lines of Southern California Edison Company.

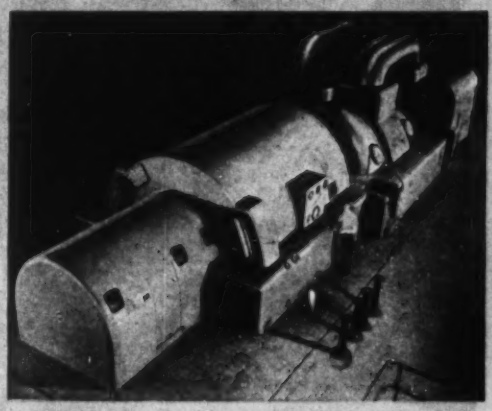
Equipment for Power: Water Conditioning equipment, chemicals and service . . . Steam and Hydraulic Turbines . . . Generators . . . Condensers . . . Steam Jet Air Ejectors . . . Power Plant Pumps and Motors . . . Transformers . . . Circuit Breakers . . . Switchboards and Control . . . Switchgear . . . Unit Substations . . . Utilization equipment.

ALLIS-

in Power Equipment

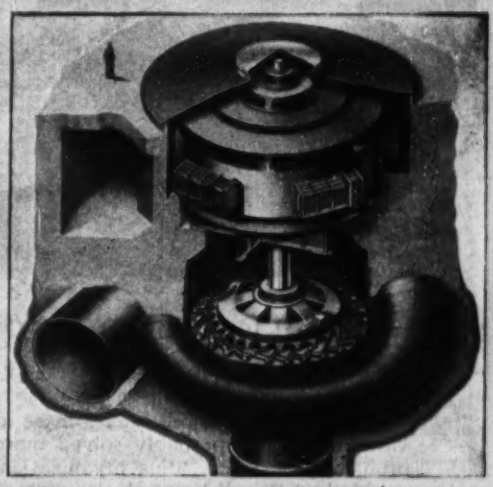
First *Supercharged* Generators

By cutting generator size, supercharged hydrogen cooling permits smaller plant size, lower foundation and crane costs, and smaller breaker and bus structures; now, maximum turbine-generator unit ratings are not limited by mechanical design. A-C turbine generators built for direct rotor conductor cooling have proved themselves in commercial service. The first of these — the world's first supercharged unit — has established a 99.89% availability record during its two full calendar years of operation. And A-C is building a fully supercharged generator affording further economic advantages.



Reversible Pump-Turbine Units

Pioneered by Allis-Chalmers, reversible pump-turbines can solve some troublesome peak load problems. They do this by reducing the amount of equipment formerly needed for pumped storage operation; the single unit operates alternately as a turbine-generator and as a motor-driven pump. One 20,000-hp pump-turbine is now in operation, and four others are in production, with turbine ratings ranging from 12,650 to 120,000 hp. The latter will combine the world's largest motor, with a rating of 102,000 hp, and the largest Francis turbine ever built.



Multi-Steam-Path Condensers

Allis-Chalmers is supplying six 100,000 sq ft surface condensers for the 2,200,000 kw of added private utility capacity being provided for AEC's Ohio diffusion plant. A-C multi-steam-path condensers have consistently helped to cut power costs. With 60 years of experience building over 13,000,000 sq ft of condenser capacity, A-C has the proven engineering and manufacturing facilities to build the largest condensers that might be required.

CHALMERS

A-C ALLIS-CHALMERS

For more information, contact your nearby A-C representative, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

"You see POWELL VALVES everywhere!"

Naturally! Since Powell makes more kinds of valves—and has probably solved more valve problems—than any other organization in the world. And Powell Valves have a record of dependable flow control since 1846.

Just name the kind of precision valve you need—Powell can supply it. Made ⅛" to 30" and 125 pounds to 2500 pounds W.S.P. Bronze, iron, steel and corrosion resistant alloys. Available through distributors in principal cities. On problems, write direct to The Wm. Powell Company, Cincinnati 22, Ohio.

CONTROLS FOR THE LIFE LINES OF INDUSTRY

Powell Valves

108th year

MAXITORQ
Overload Release
CLUTCH

minimizes machine Down-Time

AT THE
GILLETTE SAFETY RAZOR CO.

The Maxitorq automatic Overload Release Clutch was designed especially to protect high-speed machinery, and we are gratified to have testimonials such as the following:

"The Gillette Safety Razor Company chose the Maxitorq Overload Release Clutch to protect a section of their blade and shaving cream packaging machines against costly down-time due to unpredictable machine jams.

"Over a period of a year, wrapping millions of blades per week, Maxitorq Clutches have eliminated machine down-time except in a few minor instances. Thus, more constant production has been maintained in the packaging department."

When an accidental overload occurs, the clutch automatically releases, stopping the machine, preventing damage to machine and product. When the jammed condition has been cleared, the clutch is re-engaged and the machine is again in operation. By means of a simple finger-tip adjustment, the clutch is set to transmit the normal running load.

There are six sizes, ¼ to 5 h.p. @ 100 r.p.m.; max. working torque ft. lbs. 13 to 263. Maxitorq "floating" discs prevent heating in neutral, and all assembly, take-apart, and adjustments are manual; disengagement is instant and complete. Submit your clutch problems to our engineers for practical solutions.

SEND FOR CATALOG NO. ME-7.

8CJ53

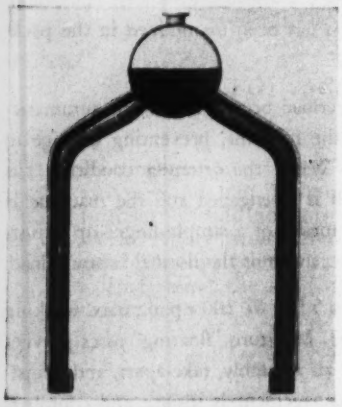
THE CARLYLE JOHNSON MACHINE COMPANY
MANCHESTER • CONNECTICUT

AN *Exclusive* ERIE CITY DESIGN

The VL with EXCLUSIVE features guarantees a minimum of furnace maintenance and insures a positive supply of clean water to the water walls. These EXCLUSIVE features are the result of many years of experience in building two drum boilers; thousands of which are operating in the field today, giving users the satisfactory service they demand.

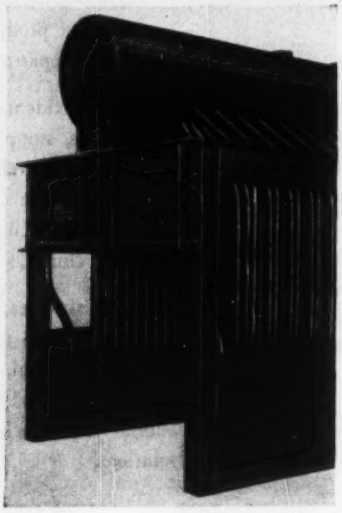
We Pay Royalties to No One for These Designs

COMPARE THESE *Exclusive* FEATURES



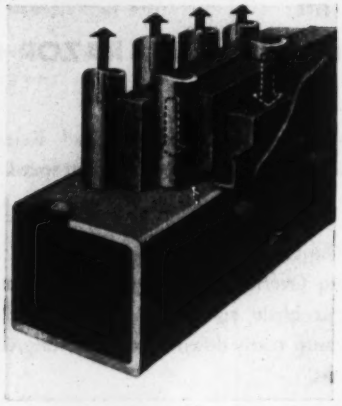
RING-FLOW CIRCULATION IN EACH WATER WALL ELEMENT

For each pair of inside steam tubes, there is a water circulating tube which feeds **clean** water from the top drum to bottom water wall headers. Dividing insulation keeps water circulating tubes cool while heat is carried away from refractory by the steam generating tubes, assuring ring-flow circulation in each element.



POSITIVE WATER SUPPLY TO WATER WALLS

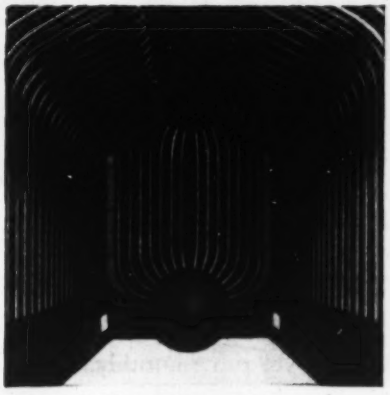
Normal water level is at the middle of the top drum, but to **assure positive water supply** to bottom headers, under any abnormal conditions, we locate a pair of front feeder tubes at lowest point in the top drum.



WATER WALLS ACCESSIBLE FROM OUTSIDE THE SETTING

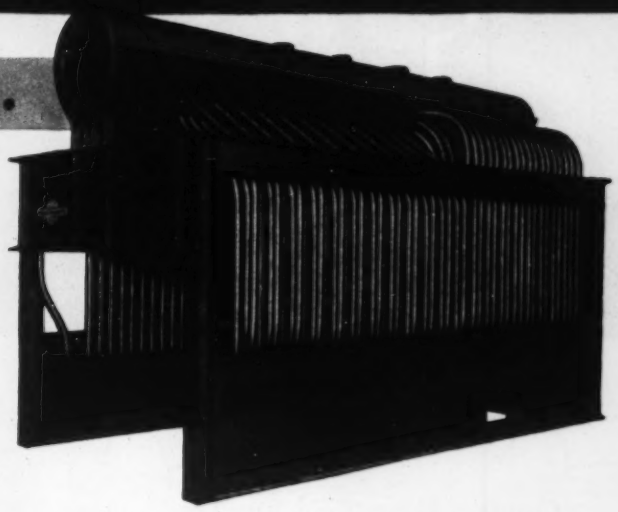
No need to go into the furnace to inspect the water wall headers —VL's are equipped with large handhole openings, **located outside the setting,** for access to any part of the header. No elaborate tools required to remove handhole plates. View above also shows how each downcomer tube supplies a pair of steam or riser tubes in side water wall element.

WITH THE FIELD....



LOW FURNACE ROOF PROTECTS BOILER TUBES

Furnace tubes entering low on the drum **protect drum shell** and top ends of boiler tubes from radiant heat absorption in the event of water low in the gauge.



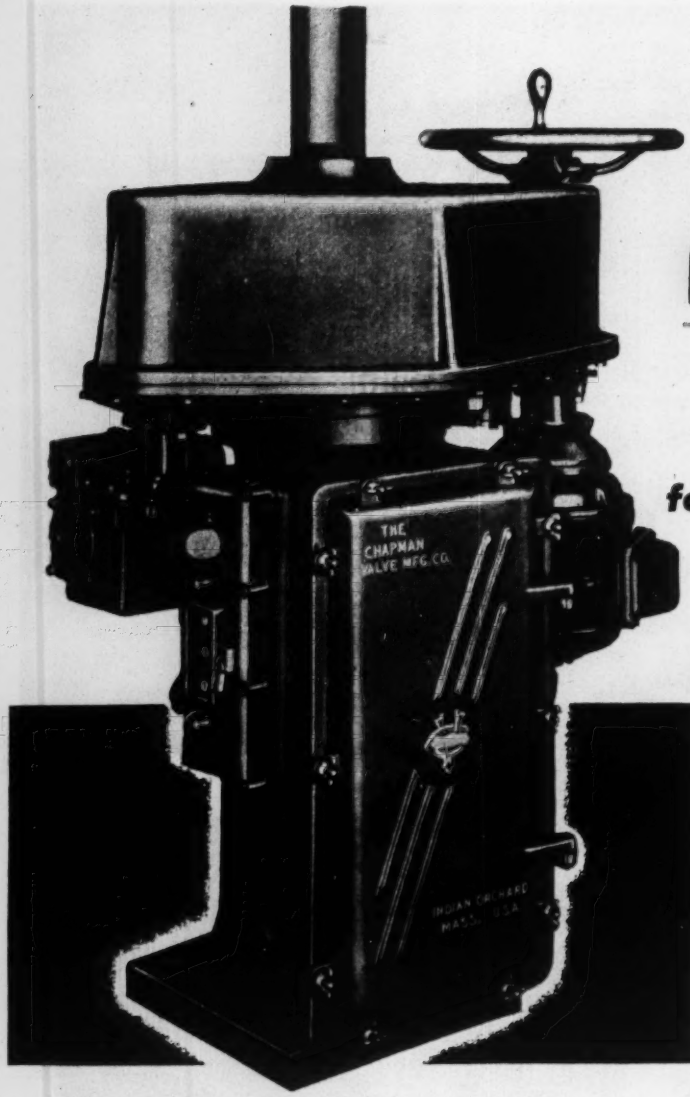
The VL's integral water wall design with large water and steam capacity combine to make this steam generator universally accepted for its good performance, low maintenance, and ready adaptability to any firing method. Catalog SB-43 gives a detailed description and dimensional data on the Erie City VL Steam Generator.

You can depend on Erie City for sound engineering

ERIE CITY IRON WORKS • *Erie, Pa.*

STEAM GENERATORS • SUPERHEATERS • ECONOMIZERS • AIR PREHEATERS

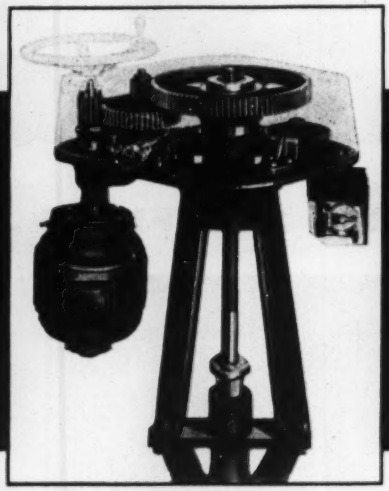
UNDERFEED AND SPREADER STOKERS • PULVERIZERS



Simple and RUGGED...

CHAPMAN'S MOTOR UNIT

for Valves, Floorstands and Sluice Gates



Floorstand equipped with Motor Unit . . . control panel, motor, limit switch and push button station.

Simple, durable mechanism of Chapman's Motor Unit. Handwheel remains stationary during motor operation.

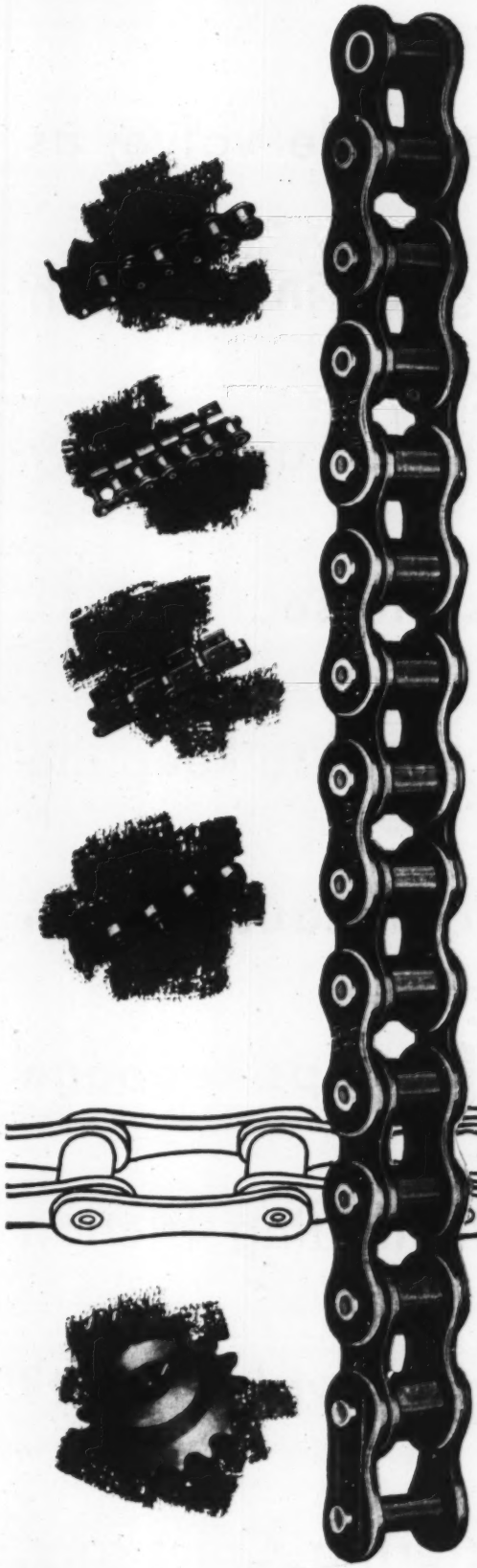
Chapman Motor Units have fewer components than any other units, providing greater dependability, much lower maintenance costs.

There are only two pinions and two gears in the motor reduction train: drift is eliminated and lash is negligible. Your valves seat tight, but not too tight. Operation is *always* smooth and trouble-free.

You can mount the Chapman Motor Unit in any position, at any angle required. The rugged stub-tooth gears require no grease or oil bath . . . yet run smoothly, quietly, with minimum wear.

Weatherproof and steam tight, Chapman's floorstand units are shipped completely wired, ready to connect to your power leads, for easy, rapid installation. This modern motor unit is dependable and economical. Send for *new* catalog No. 51.

The CHAPMAN Valve
Manufacturing Company
INDIAN ORCHARD, MASSACHUSETTS

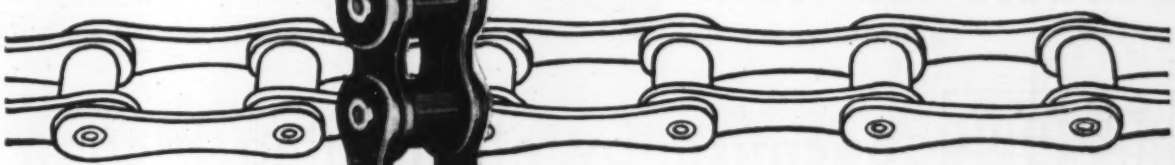


SAVE handling costs

Here's a good way to solve the problem of moving materials through the machines you design... the complete line of Rex Roller Chains, Sprockets and standard and special Attachments. Whether it's moving bread through a wrapping machine... milk cartons through the bottling machines... or metal parts through a plating machine, there is a Rex Roller Chain and Attachment that can do it more efficiently... at lower costs.
Your Chain Belt District Sales Engineer will be happy to assist you with your selections or to recommend the design of an attachment to suit your individual needs.
Call him or mail the coupon today.

CHAIN BELT COMPANY

District Sales Offices in All Principal Cities



CHAIN BELT COMPANY 54-405
4765 W. Greenfield Avenue
Milwaukee 1, Wisconsin

☐ Please send me literature on Conveying with Roller Chains.
☐ Have Chain Belt man call.

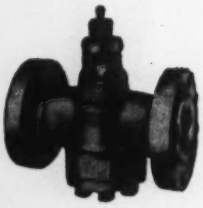
Name.....

Company.....

Address.....

City..... ..... *Zone*..... *State*.....

PRINTED IN U.S.A.

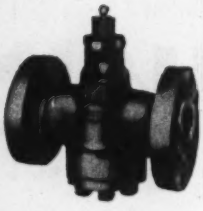
THIS  is a remarkable valve, as

.. Lubricant goes in through

grooves in the plug . . . . and body

three things—it lubricates the seat . . .

acts as a hydraulic jack . . . . to keep the

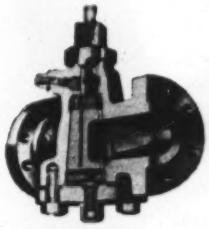
this valve  is safer, because it can

because lubricant stops seepage

because, by eliminating friction

most valves. What kind of valve is it?

by **ROCKWELL** Manufacturing Company,

you will quickly see when you look inside the stem and is forced through  .. In service, this lubricant does —it seals off the seating area .. .and it plug in position to turn easily. Consequently always be operated in an emergency, and, before it starts. It's also more economical and abrasion, lasts much longer than

Naturally, it's **ROCKWELL-NORDSTROM,**

Pittsburgh 8, Pennsylvania.

Canadian Licensee:
Peacock Brothers Limited

7,000

7,000 ITEMS A KEY TO K&E LEADERSHIP

Drafting, Reproduction, Surveying
Optical, Testing Equipment and Materials
Slide Rules, Measuring Tapes

• Since 1867 engineers, scientists, designers, surveyors, draftsmen have relied on K&E as the foremost, most progressive, and most complete source of supply for the tools, equipment, and materials they work with. When you buy, think first of K&E, headquarters for 7,000 items. For example . . .

ALBANENE® TRACING PAPER—This popular tracing paper is recognized as the top product in its field because of its permanent transparency, its unusual strength and its superb drawing surface.

Albanene is transparentized with an inert resin, which is permanently fixed in the fibers and unaffected by age. Its outstanding tearing strength enables it to resist wear and tear in reproduction machines and in handling and filing. Its special surface combines ideal pencil "take" with clearness, sharpness and cleanness of line.

KEUFFEL & ESSER CO.
New York • Hoboken, N. J.
Chicago • St. Louis • Detroit • San Francisco • Los Angeles • Montreal
Distributors In Principal Cities

preference points on power transmission units

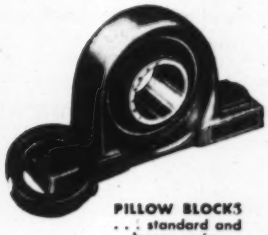
Not one but two GREASE PORTS!

A Two grease ports . . . 180° apart.

B Never more than 90° from lubrication fitting.

If you select power transmission units with re-lubrication in mind, you'll appreciate the importance of the Fafnir two-grease-port design to dependable ball bearing performance. There is always one grease port in the bearings' outer ring that is never more than 90° from the lubrication fitting . . . and this fitting, incidentally, can be your own type because Fafnir provides standard pipe plugs.

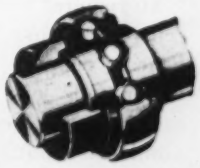
Point by point comparisons of design features, from the Fafnir-originated wide inner ring ball bearing with self-locking collar . . . easiest of all to install . . . to the frictionless Mechani-Seals . . . explains the steadily-growing preference for Fafnir Ball Bearing Power Transmission Units. For details, call your nearby Fafnir distributor. The Fafnir Bearing Company, New Britain, Conn.



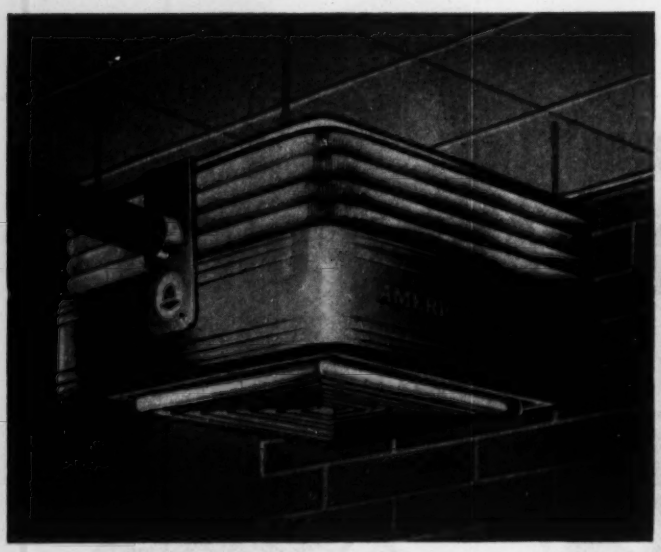
PILLOW BLOCKS
. . . standard and heavy series

FLANGE CARTRIDGES
. . . standard and heavy series

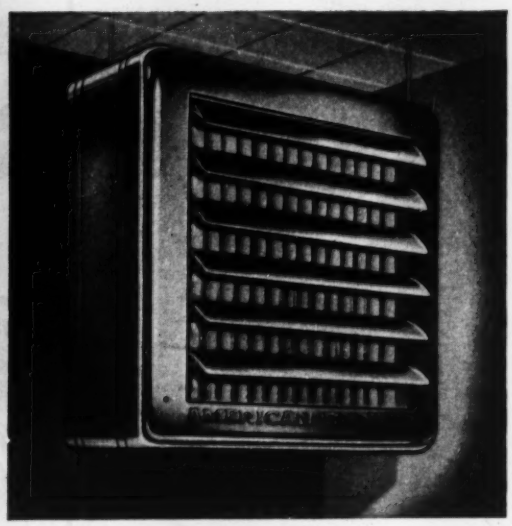
CYLINDRICAL CARTRIDGES
. . . standard and heavy series



WIDE INNER RING BALL BEARINGS
. . . with Mechani-Seals



Venturafin Vertical Unit Heater. Capacities: 58,400 to 560,000 BTU at 2 pounds steam pressure and 60° F. entering air.



Venturafin Horizontal Unit Heater. 18,000 to 357,500 BTU at 2 pounds steam pressure, 60° F. entering air.

Announcing

the new American Blower Venturafin Unit Heaters

At last—a horizontal heater that's truly quiet . . . a vertical heater with heat-flow control! Both in a wide range of sizes!

They're here, now! New Venturafin Unit Heaters — quiet operating, efficient, easy to install . . . yet priced with the lowest!

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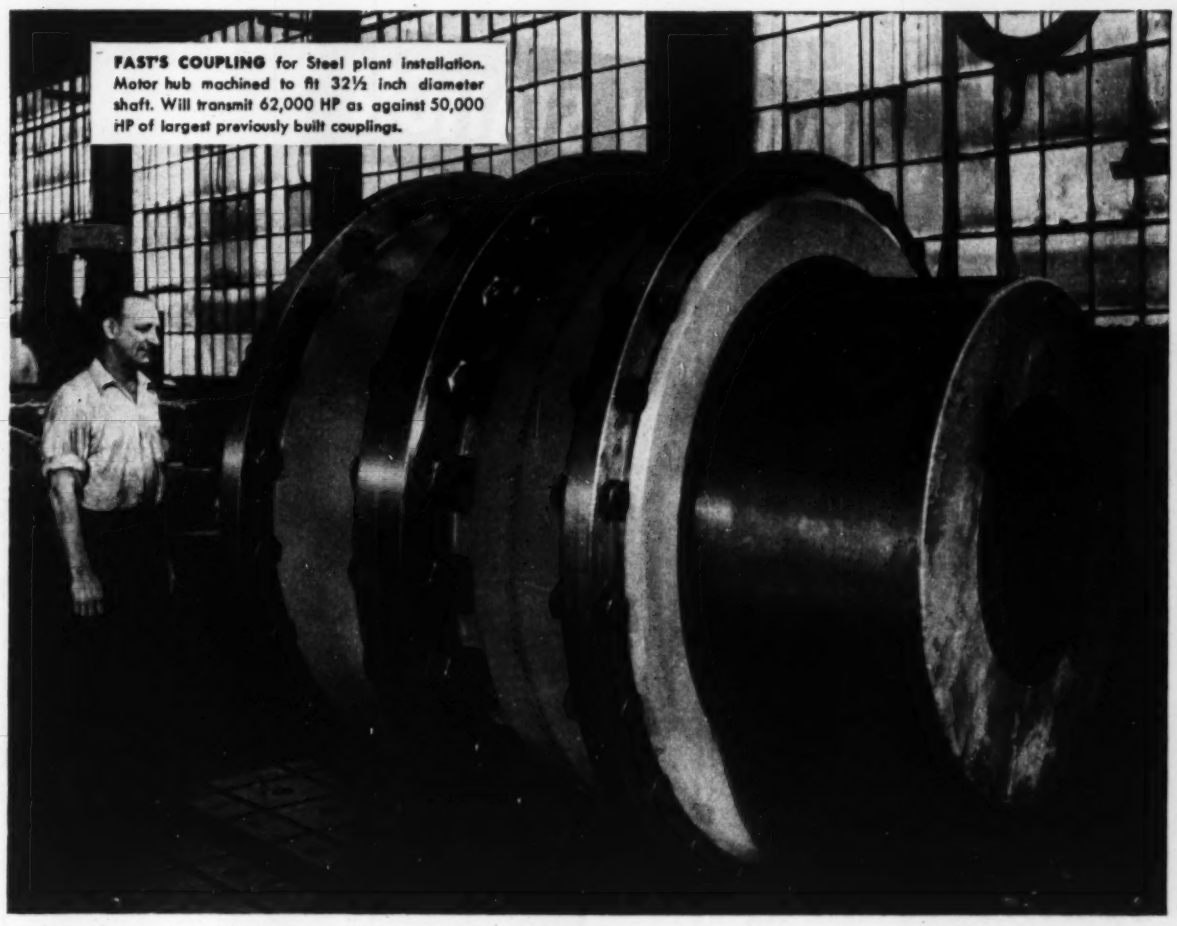

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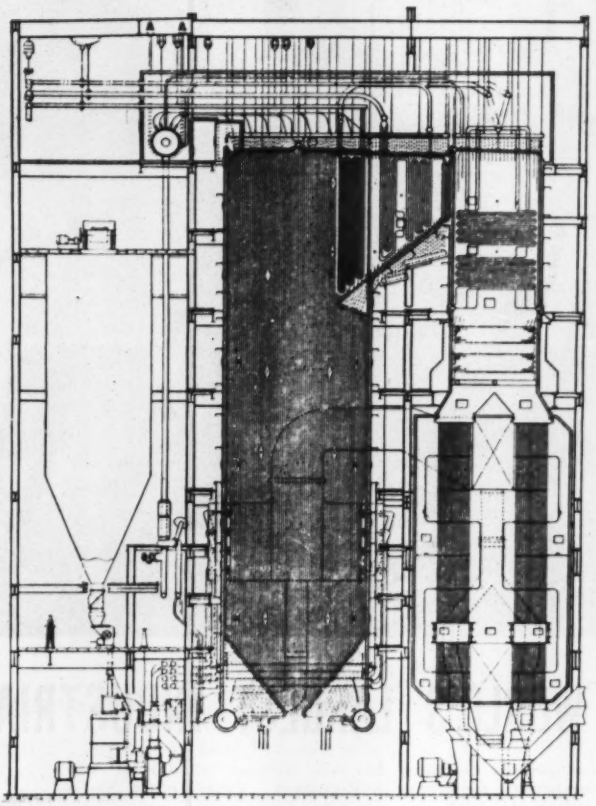

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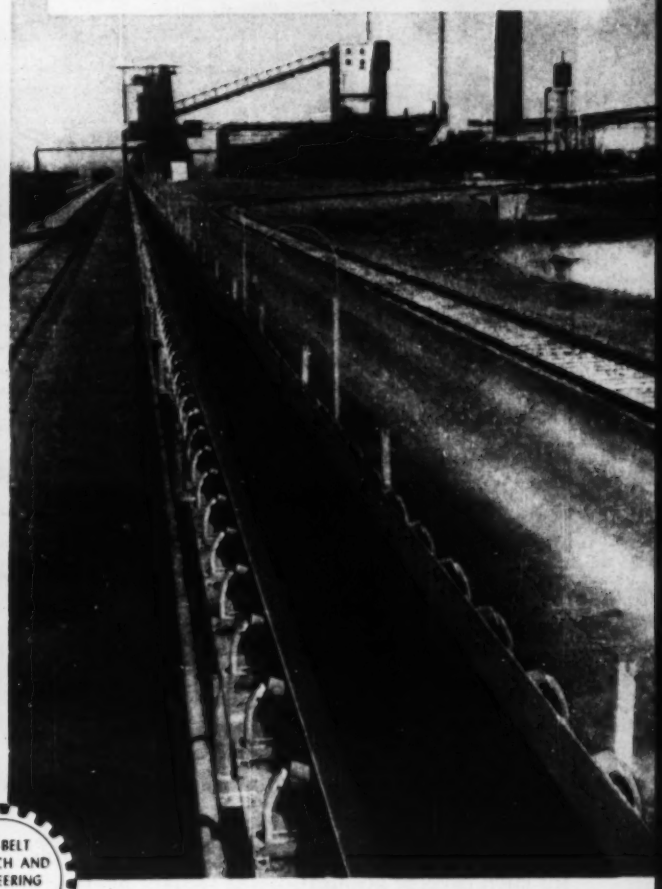

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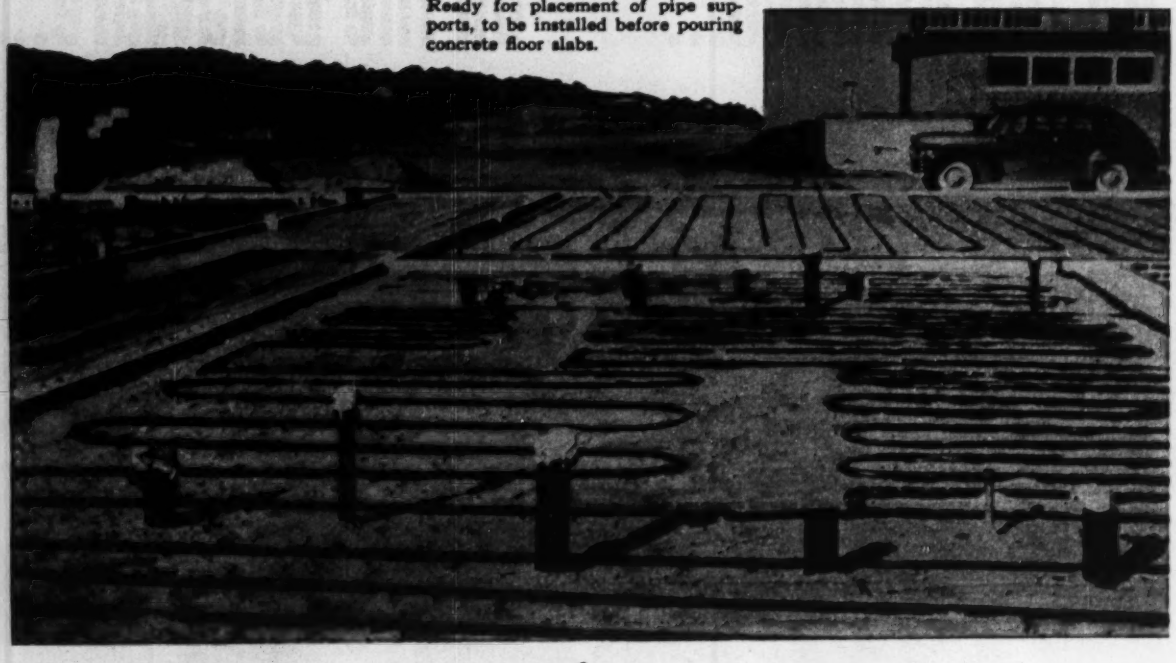

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MECHANICAL ENGINEERING

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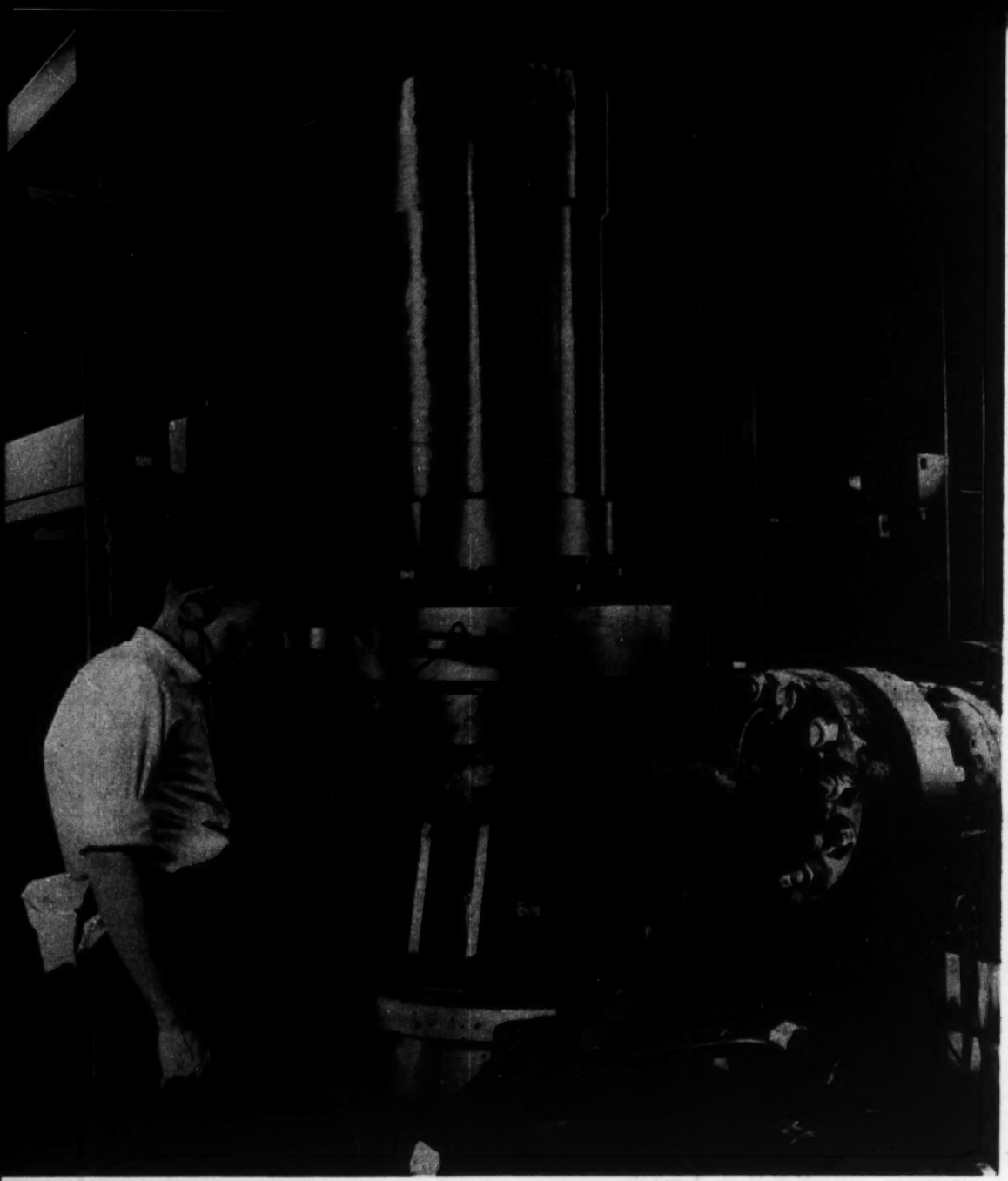

Canned motor pump developed for the AEC . . .

. . . is shown in operation in test loop. A series of hermetically sealed centrifugal-type motor pumps have been developed for operation with water at approximately 500 F and at a pressure level of 2000 psi. Conventional-type shaft seals have been eliminated by enclosing the entire motor and pump assembly into one hermetically sealed housing. Four units have been developed to date having capacities ranging from 30 gpm and 30 psi to 4000 gpm and 100 psi. Operating times on existing units vary from as much as 18,000 hr on the smaller sizes to 5000 hr on the larger ones. The canned pump was developed by Westinghouse Electric Corporation under its contract with the Atomic Energy Commission for carrying out the Submarine Thermal Reactor Project. Similar pumps will be used in the first central-station atomic-power plant. See pp. 585 to 588 of this issue.

Editorial

MECHANICAL ENGINEERING

July, 1954, Vol. 76, No. 7 . George A. Stetson, *Editor*

Section-Division Co-Operation

THROUGHOUT its long history The American Society of Mechanical Engineers has been confronted by the problems based on the breadth and diversity of its members' individual specialized technical and professional interests—their "bread and butter" interests—on the one hand, and by conditions imposed by the widely scattered localities in which the members live and work, on the other.

Attempts to overcome the difficulties arising from diversity of interest and geography are reflected in the organizational structure of the Society. To serve specialized interests the Constitution of the Society provides for Professional Divisions; to serve geographical interests it provides for Sections.

"The object of each Professional Division," according to the By-Laws, "shall be to provide, through an organization of members of any or all grades particularly interested in a branch of engineering included in the scope of the Society's activities, means for promoting the arts and sciences of that branch."

"The object of a Section of the Society," the By-Laws state, "shall be to provide means for promoting the work of the Society by a local organization of members who are resident within a given territory."

Professional Divisions and Sections are, in a sense, societies within the Society to the extent that both are operated by committees, plan and conduct meetings or sessions at Society meetings, solicit papers and speakers, and carry on a variety of other activities. The essential differences between them are that Professional Divisions are national in scope and limited to the specialized fields of technical interest they aim to serve, while Sections are essentially local in scope but serve technical and professional interests that are as broad and highly diversified as those of the parent Society.

The principal objective which the Professional Divisions and the Sections share in common is to serve the best interests of the Society and especially the needs of each individual member. Practical considerations place limits on the extent to which Professional Divisions and Sections can achieve this objective and on the ability of an individual member to benefit to the fullest extent from the services rendered on his behalf by the Divisions and Sections. Successful operation of a Division or a Section depends on a lot of hard work done by committeemen dedicated to the service of their profession, their Society, and their fellow members. It depends also on the response of individual members to the efforts exerted on their behalf.

Many plans have been evolved during the years to bring about a closer co-operation between the Professional Divisions and the Sections in their common purpose of serving the Society and its members. The effectiveness of these plans will vary with the particular conditions which exist in a given Section and with the intensity with which the members of the Section apply themselves to make them work in their communities. No plan is automatic. Every plan demands leadership and a high level of intelligence and adaptability for its application. By studying the experiences of other Sections with plans that have been adopted and by making use of the aid and suggestions of the Professional Divisions, each Section can vitalize its current programs and supplement them with activities that will create greater interest and member participation, serve more directly members who have specialized interests, and build up not only attendance at Section meetings but membership-development efforts as well.

The ASME Professional Divisions Committee has a Subcommittee on Section-Division Co-operation, under the chairmanship of Samuel G. Eskin, which stands ready to assist Sections in developing a greater variety of subject matter which appeals strongly to members having specialized technical interest in fields in which the Professional Divisions are operating. Some Professional Divisions appoint to their executive committees, associate members representing the regions for the purpose of maintaining direct contacts between Sections and Divisions. Some Sections have invited a Professional Division to hold its annual conference in their community, thus serving the members of the Section whose work is related to the interests of the Division.

Particularly successful in meeting the needs of small groups of members who have specialized but related interests, is the organization of one or more discussion groups within a Section. The experience of the Cleveland Section with this scheme was reported in the April issue (pages 385–386). And in the June issue (pages 547–548) the Rochester Section reported how an active Professional Divisions Program jacked up Section meeting attendance and provided stimulating opportunities for specialists to get together for discussion of their common interests. By effective Section-Division co-operation everybody benefits, and both Sections and Divisions more completely fulfill the purposes for which they are organized.

The Role of Shock-Testing Machines in Design

Shock tests have become an important factor in the qualification of equipment that is intended for military service or that will be subjected to rough handling

By Charles E. Crede

The Barry Corporation, Watertown, Mass. Member ASME

SHOCK-TESTING machines are used primarily for testing equipment that is intended for installation in military vehicles, aircraft, and ships, and for testing equipment that will be transported. The shock originates generally from a large force that is suddenly applied to the structure or housing which supports the equipment. The equipment generally sees only the motion of this structure, and shock is thought of in terms of the motion of the support for the equipment. A shock motion usually embodies a significant displacement and a sudden change in velocity; in most instances it is oscillatory in nature and includes several apparent frequencies. These characteristics are reproduced in shock-testing machines by mounting the equipment under test to a structure that experiences a sudden change in velocity.

One of the earliest shock-testing machines is illustrated in Fig. 1. This machine, intended for testing small electrical instruments, has an elevator platform approximately 6 in. square to which the instrument undergoing test is attached. The elevator is lifted by hand to a height of approximately 1 ft, and permitted to fall freely. The downward motion of the elevator is arrested when a leaf spring carried by the elevator engages an anvil secured to the base of the machine. The machine illustrated in Fig. 2, a later development, operates on the same general principle but is intended for testing much larger equipment. The elevator is approximately 36 in. square and is arranged to fall from a height as great as 5 ft into a sandbox forming the base of the machine. The resulting cushioned impact is considered appropriate to qualify equipment for use in military aircraft.

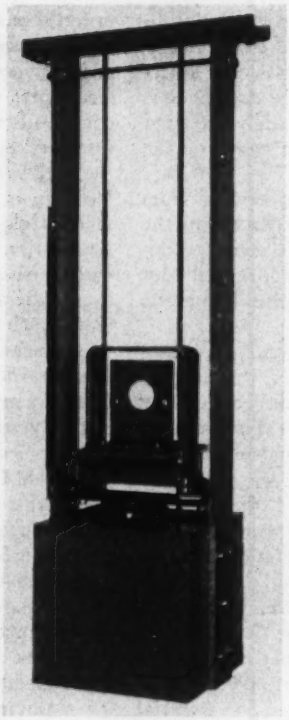

Fig. 1

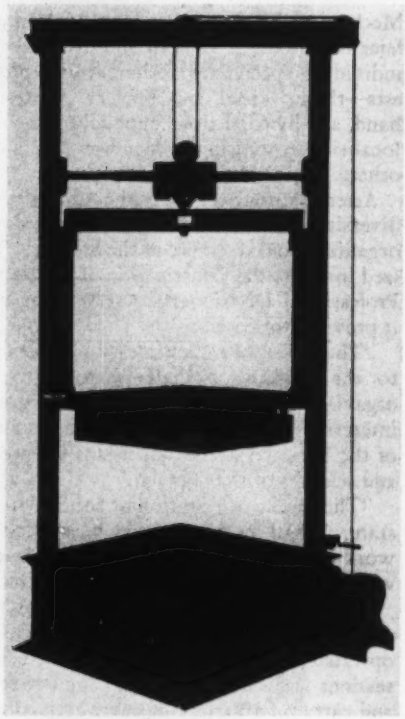

Fig. 2

Fig. 1 Drop-type shock-testing machine for electrical instruments

Fig. 2 Drop-type shock-testing machine for medium-sized equipment

A somewhat different type of machine is illustrated in Fig. 3. The equipment undergoing test on this machine is attached by means of suitable adapters to a vertical mounting plate. The mounting plate suddenly acquires an appreciable velocity as a result of being struck by either a pendulum-type or a vertically falling hammer. Specifications impose a weight limit of 250 lb on equipment to be tested on this machine; heavier equipment is tested on the machine shown in Fig. 4. The latter machine operates on a principle similar to that embodied in the machine shown in Fig. 3 and is perhaps the largest shock-testing machine in common use. The mounting plate is horizontal and suddenly acquires an upward velocity as a result of being struck on the bottom by a pendulum-type hammer which swings through an arc as great as 270 deg.

Contributed by the Machine Design Division and presented at the Semi-Annual Meeting, Pittsburgh, Pa., June 20–24, 1954, of THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS. (Condensed from ASME Paper No. 54—SA-12.)

Correlation of Shock Tests and Service Conditions

Few measurements of shock during actual service conditions were made during the early days of the de-

velopment of shock-testing machines. As time and facilities became available, and measurement techniques were refined, an increasing volume of data on the shock experienced in service became available. As this quantitative information has increased in volume, the dilemma of those engaged in shock testing and in designing to withstand shock appears to have increased also. With the accumulation of data has come a change in viewpoint. There has arisen a tendency to look upon a shock-testing machine not as means to cause a certain type and degree of damage to equipment but rather as means to reproduce certain numerical parameters found in the measurement of shock.

A shock test should be considered primarily as means to reject equipment that is not sufficiently rugged to withstand the rigors of military service. The ability of equipments to withstand service conditions can be evaluated only by a study of the experience with the equipments during service. Such a study should be approached statistically, and the results should be directed toward separating the qualified from the unqualified equipment. If a shock test separates the equipment in a similar manner, it may be considered to simulate the shock encountered during service.

In general, it is not feasible to do engineering development work under battle conditions. If the shock test is adequate, however, equipment is satisfactory for battle conditions if it has passed the shock test successfully. Conversely, the severity of the shock test should be adjusted so that the equipment is not overdesigned, embodying excessive weight and cost. If the nature and severity of the shock test have been correlated successfully with military service conditions, the principal problem of the designer is to determine how to design equipment so that it will withstand successfully the test imposed by the shock-testing machine. Compared with the problem of establishing shock-test severity, this latter problem is relatively easy because the performance of shock-testing machines tends to remain much more uniform than conditions existing during military action.

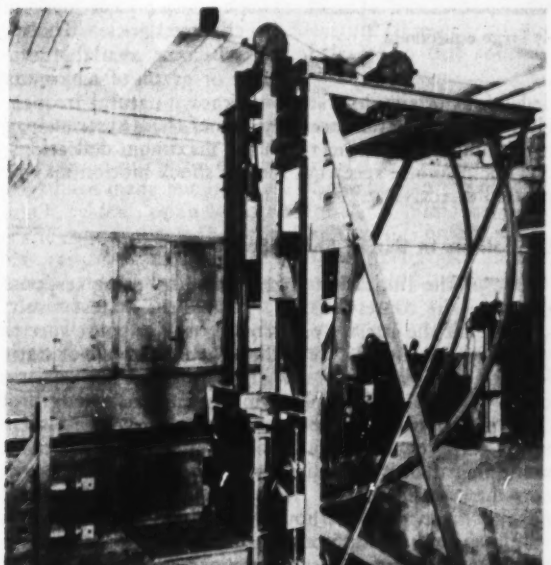

Fig. 3 Hammer-type shock-testing machine for relatively light equipment

Designing Equipment to Withstand Shock

First attempts at designing equipment to withstand shock were based on the assumption that the required strength could be calculated directly from the measured maximum acceleration of the supporting structure. In other words, using the equation $F = ma$, the maximum force F acting on a structure of known mass m could be determined by measuring the maximum acceleration a of the supporting structure. The work of Frankland,[1] Mindlin,[2] and others during World War II was of tremendous importance in proving this concept false and in starting new thinking along more rational lines. The essence of the current approach to this problem is the recognition that the effect of the shock upon equipment is of much greater importance than the characteristics of the shock itself.

A concept of damage resulting from shock may be visualized by referring to the idealized equipment illustrated in Fig. 5. This equipment consists of a housing containing structural members exemplified by the cantilever beam. The severity of the shock evidently is indicated by the maximum stress in the beam. If the beam were infinitely rigid, the mass at the end of the beam would have the same acceleration as the housing and the maximum stress in the beam would be directly proportional to the maximum acceleration of the housing. Actually, however, the beam deflects and the acceleration of the supported mass differs from that of the housing. As a consequence, the maximum stress in the beam generally is a function not only of the shock motion but also of the properties of the beam.

This principle may be refined by stating that, for a given shock motion and to a first approximation, all beams of the same fundamental natural frequency will experience equal maximum acceleration. This maximum acceleration is commonly expressed as a dimensionless multiple of the gravitational acceleration. If the stress in a structural member during static conditions is known, the maximum dynamic stress may be calculated by multiplying the static stress by the maximum acceleration, expressed dimensionlessly.

The problem of the machine designer is to correlate the design of the actual equipment with the idealized structure shown in Fig. 5. A promising method has been suggested to aid designers in determining the maximum stress in a machine member. This method employs response spectra. The response spectrum for a given shock motion may be defined as the maximum acceleration of the load on the cantilever beam in Fig. 5, expressed as a function of the fundamental natural frequency of the beam.

Response spectra may be expressed graphically, as shown in Fig. 6 for two typical shock motions. The peaks in the curves of Fig. 6 occur when the natural frequency of the cantilever beam coincides with a promi-

[1] "Effects of Impact on Simple Elastic Structures," by J. M. Frankland, Proceedings of the Society for Experimental Stress Analysis., vol. 6, no. 2, 1948, p. 7.

[2] "Dynamics of Package Cushioning," by R. D. Mindlin, *Bell System Technical Journal*, vol. 24, nos. 3-4, July-October, 1945.

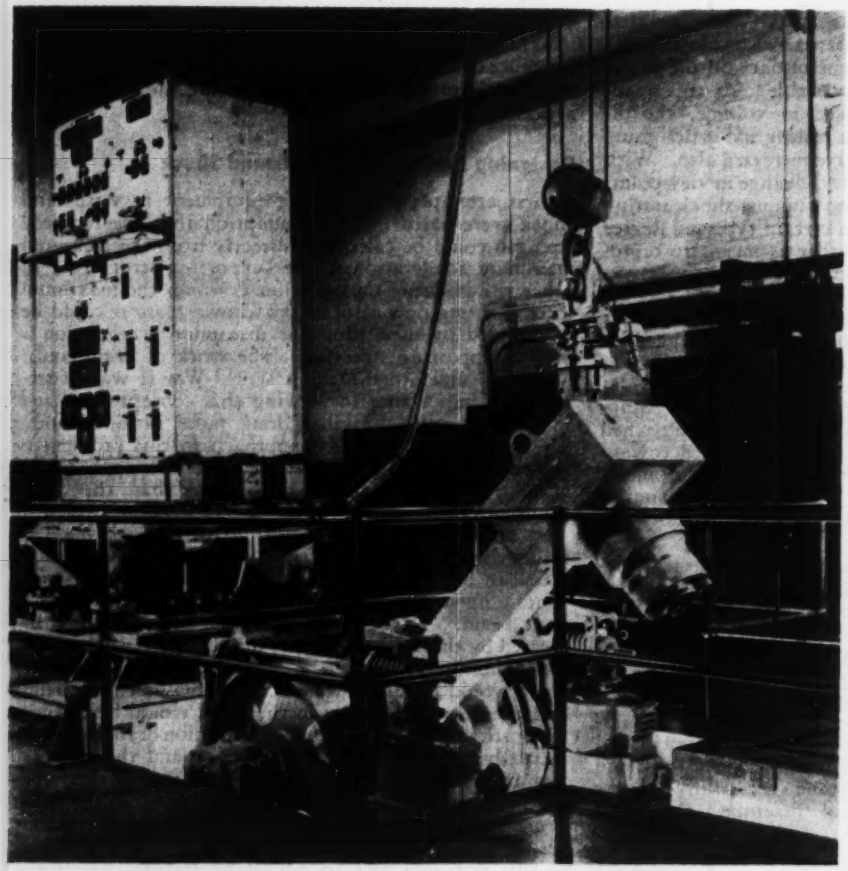

Fig. 4 Hammer-type shock-testing machine for relatively large equipment

nent frequency of the shock motion. A transient type of resonance then occurs. If the response spectrum for a particular shock motion is known, the maximum stress in any beam may then be calculated using the known beam natural frequency and maximum acceleration of the load on the end of the beam.

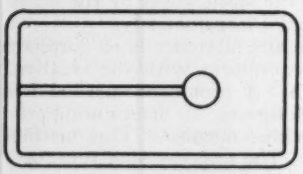

Fig. 5 Schematic representation of idealized equipment

Obtaining Response Spectra

Various means are available for obtaining response spectra. A record of the shock motion is required, expressed in terms of displacement, velocity, or acceleration as a function of time. It is then necessary to determine the response of a simple system to this shock motion, for a wide range of natural frequencies of the system. This can be done graphically or numerically, but the process is very laborious. A more practical procedure is to employ a mechanical or electrical analog. Most of the response spectra that are available have been obtained by analog methods.

A major advantage of the spectrum method is that the most laborious portion of the design work is finished when the response spectrum has been obtained. The spectrum may be used repeatedly for all structures and remains continuously valid. This greatly facilitates design work that must be done on a cut-and-try basis, as where the natural frequency and the strength of the structure are not mutually independent.

A mechanical instrument that makes it possible to obtain response spectra without recording the time history of the shock motion has been proposed recently. Such an instrument is comprised of a framework, supporting several cantilever beams of different natural frequencies, and means to record the maximum deflection of each beam. When used in the laboratory, the instrument is mounted on the shock-testing machine in the same manner as the equipment to be tested. The recorded maximum deflections of the beams thus indicate the effect of the shock, rather than measure its characteristics. The results become available as a table or graph of maximum deflections of simple systems of known natural frequencies. The maximum accelerations of these systems may be computed from the measured maximum deflections, and the response spectrum for the shock motion may be plotted directly.

Limitations in Use of Shock Spectra

One of the limitations of the method using response spectra is its conservatism. An analysis of test results shows that the stresses predicted by the response spectra would often cause failure if they were the result of static loads. The reason for the discrepancy is not entirely clear. One possible explanation is that the strength of certain materials may be greater under dynamic than under static conditions. Another explanation, perhaps more plausible, is that slight yielding of the member occurs during the shock. Although the yielding would not be discernible without a careful examination, it would introduce sufficient damping and nonlinearity to make the response spectrum partially inapplicable. It has not been established that use of response spectra always gives conservative results. More experience is required in interpreting response spectra to attain optimum design of machine members.

Several years ago the author reviewed a large number

of Bureau of Ships' reports on failures of equipment during shock tests. An attempt to correlate these failures with the deflection of simple cantilever beams as determined experimentally was not notably successful, because the damaged members were difficult to consider as single-degree-of-freedom systems. The discrepancy with the single-degree-of-freedom concept was the result of many

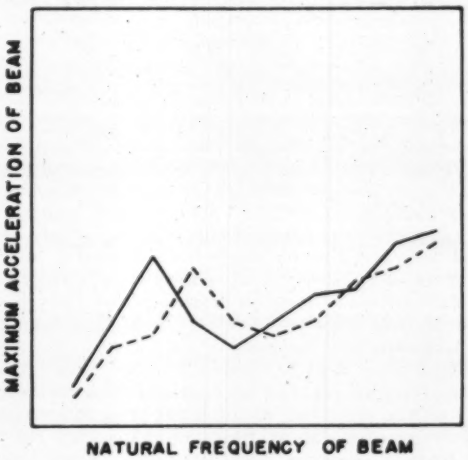

Fig. 6 Graphical representation of typical response spectra

diverse factors, such as (1) distributed mass of structural members, (2) elastic coupling with one or more other systems, (3) unknown constraints, and (4) materials whose properties were not well known, particularly in the presence of stress concentration. There seems to be a need for the machine designer, with his skill in interpreting problems of these types, to co-operate with those engaged in shock-testing research to develop a better understanding of design in this specialized field.

Qualitative Approach to Equipment Design

The most successful designers of shock-resistant equipment have made but little use of the known response of simple systems as an indication of the required strength of the equipment. The procedure that has produced the best results is to follow established principles in the design of shock-resistant equipment and to conduct frequent tests to determine required strength. This is primarily a qualitative rather than a quantitative problem. A number of applicable principles have become established as a result of an analysis of many successful designs.[3]

Inasmuch as a shock test causes a transient response of structural members of the equipment, some inconsistencies in test results may be expected as a result of random combinations of the transients. For development work, it has been found expedient to subject the equipment either to a greater number of tests of the specified magnitude, or to tests of magnitude greater than that specified. The "factor of safety" introduced in this manner often proves worth while in avoiding embarrassments when subjecting the equipment to final contractural qualification tests.

Establishment of Contract Requirements

The majority of formal shock tests conducted today are for the purpose of fulfilling contract requirements in the purchase of equipment by the military services, or in development work leading to the fulfillment of such contracts. It is extremely important that shock-testing specifications be definite and explicit. Equivalent tests conducted at different testing agencies must produce substantially the same result or contractural difficulties arise. From a purely practical viewpoint, this requirement overshadows all others in the administration of shock-testing procedures. Tests thus tend to become arbitrary, and initial considerations leading to the establishment of the testing specification tend to become lost as time goes on.

It is of great importance that shock-testing standards be established wisely, and only after a thorough study of all pertinent factors. Wartime experiences provided a considerable quantity of damaged equipment which was used as a basis for setting up initial shock-testing requirements. This was an unusual condition and its repetition would be costly and impractical under normal conditions. It should be recognized, however, that information of this type is of utmost importance for validating a shock-testing standard.

Perhaps the problem can be approached in a more hypothetical and analytical manner by comparing the response of an idealized structure, such as the beam in Fig. 5, to both the shock experienced in service and that produced by shock-testing machines. Numerous measurements of shock under service conditions have been and are being made. By analogs or other convenient methods, the response of simple systems of various natural frequencies can be determined for both actual service and shock-testing conditions. When the response spectra for the two conditions coincide, the shock test may then be considered to have a type of equivalence with the shock experienced in service.

One of the difficulties in the way of obtaining a true equivalence of these conditions lies in the many varieties of shock motion experienced in service. There appears to be little basis for selecting one of these shock motions as a reference level for shock-testing machines, to the exclusion of other shock motions. It is perhaps logical to select the one of greatest probable severity. This selection, however, overlooks the cumulative effect of many shocks of various severities. Actual service conditions vary widely, with a consequent variation in the nature and severity of the shock. The shock recurs numerous times at various repetition rates for different severities.

Any attempt to rationalize the subject of damage experienced as a result of shock must consider the cumulative effect of repetitions of stress. A further study of the cumulative effect of repeated stress ultimately may lead to an adjustment factor which will permit a more rational correlation of repeated shocks with a single shock.

Such a procedure is not entirely without promise for a long-range program but there is not sufficient information currently available to form the basis for an immediate solution.

[3] "Designing for Shock Resistance," by C. E. Crede and M. C. Junger, *Machine Design*, December, 1950, pp. 161–167; January, 1951, pp. 131–136.

Noisome Noise—What Are Its Limits?

Recent heavy compensation claims for industrial hearing losses and their relation to production require intensive investigation

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Noise has been related to hearing damage, variances in human behavior, and communication interference (1).[1] Considering each of these topics in turn, there is no doubt that some occupational noises, and to some extent, everyday noises, can cause temporary and perhaps permanent hearing loss. This has been indicated experimentally (2, 3, 4, 5, 6, 7, 8) and clinically (9, 10, 11, 12, 13, 14, 15) in man and in animals.

However, there is much uncertainty when separating and evaluating the possible factors that might be responsible for any noise-associated decrease of the hearing function. There are such complicating variables as the following:

Hearing—Loss Factors

Aging, which seems to be associated with hearing loss. It appears that among older people a great degree of deafness may be the result of advancing years solely, for there often is no definite history of exposure to unusual occupational noise (1, 12, 13). It is presumed that this deterioration is a part of the aging process, but it also has been surmised (9) that the noises of everyday life may be accountable.

Temporary losses of hearing present another complication, since it has been observed (1, 6, 10) that measured hearing losses associated with noisy environments may be improved following removal from the noise source. This recovery may continue for as long as 6 months to a year and raises the question of whether the hearing losses reported related to noise may have followed measurements of defects that would have been dissipated, at least in part, with rest.

Related effects of noise frequency and intensity must be considered in order to understand fully the character of a noise in question. The identification of a noise merely in terms of its sound-pressure level will not necessarily indicate the possible damaging effects of the noise. Most investigators, in the past, reported only the noise level for the environment in question, but the usual sound-level meters indicate the sum of the sound pressures[2] over the range of sound frequencies. Therefore, for a noise having present all audible frequencies at equal sound-pressure levels, the over-all sound-pressure level may be considerably higher than for any one frequency band of the noise. Further, there is increasing acceptance that the harmful effects of noise may be expected to vary directly with both intensity and frequency (1, 16, 17, 18). This implies, therefore, that before the effects of noise on hearing acuity can precisely be stated, it is necessary to relate the hearing damage to both frequency and intensity.

Other variables must be allowed for too. For example, in attempting to evaluate occupational hearing damage, faulty testing procedure of either the environment or the hearing loss of the individual would influence the findings relating hearing loss to noise. Consideration also must be given to the fact that the individual susceptibility to hearing loss due to noise varies. The noise situation in the shop may well vary over the years as processes are changed and machines replaced. Then, too, illness may be responsible for hearing loss resembling that caused by noise (21).

It will be recognized, therefore, that even though it is not difficult to identify the presence of deafness it is exceedingly hard to separate the origin of the deafness and, without equivocation, charge industry with being solely responsible for its presence.

Criteria for Hearing Damage

The complications are further heightened when consideration is given the attempts to establish criteria for hearing damage. Sterner (18) conducted an interesting questionnaire of 275 persons professionally interested in establishing a safe-limit standard for noise. Of this number 222 responded. Principally, the questions asked for opinions on (*a*) the single over-all intensity value which is "safe" for continuous exposure, (*b*) the single over-all intensity value, beyond which it is unsafe to go for even brief or limited periods without risking hearing damage, and (*c*) the recommended frequency-intensity curve for safe exposures.

The replies for the safe-level recommendations ranged from approximately 60 to 105 decibels (db). The suggestions for the recommended maximum level beyond which hearing injury would be risked ranged roughly from 90 to 130 db. But the most interesting indication of the spread of opinion may be seen in the reproduction of the plot, Fig. 1, of estimates of safe frequency-intensity levels. It will be seen that the data as plotted indicate no grouping of points which might furnish a trend line, but instead demonstrate the wide separation of authoritative opinions.

[1] Numbers in parentheses refer to the Bibliography at the end of the paper.

[2] The American Standard for Sound-Level Meters, Z24.3–1944, specifies that the instrument be designed with three separate frequency-response characteristics, which are obtained by "weighting" networks, designated A, B, and C, and also known as "40 db," "70 db," and "flat," respectively. It is when the flat frequency response is used that a meter measures "sound-pressure levels." When measurements are made with the weighting networks, the meter is said to register sound level.

Contributed by the Safety Division, co-sponsored by the Management Division, and presented at the Annual Meeting, New York, N. Y., Nov. 29–Dec. 4, 1953, of The American Society of Mechanical Engineers.

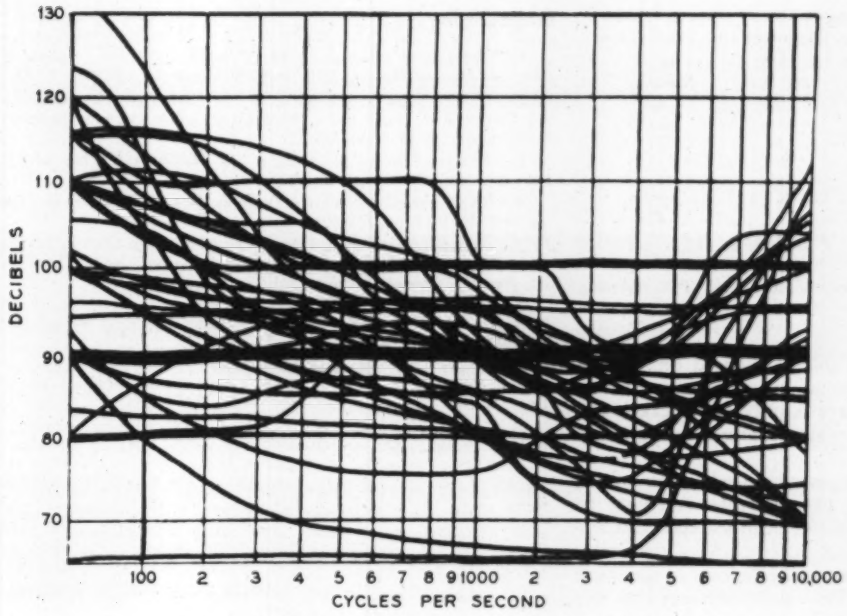

Fig. 1 Noise and hearing loss, spectral limit estimates

The problem of noise and hearing damage is brought to an annoying degree of perplexity by these unknowns, plus a sudden, recent increase in the number of claims filed for industrial hearing loss—claims which are so difficult to validate because of the complexities just indicated. It has been estimated (19) that the threat implied in this unsettled situation could well cost the nation billions of dollars. Whatever economic danger there is lies in the lack of objective information on the subject.

Safety and Other Effects

Another broad area of relative ignorance on the subject of noise lies in the area of psychological effects. It is highly probable that noise has some psychological influence on man, but in this area, much of the experimentation has been poorly controlled, resulting in questionable data (1, 20). In general, studies that have been reasonably carefully conducted indicate that psychomotor activities are not significantly affected by steady or expected noises. It may be that the insignificant effects of noise on psychomotor performance may result partly from an increased effort on the part of subjects to perform at their maximum in spite of the presence of noise, and it may be due too to an adaptiveness that takes place in the individual when he is exposed over a period of time. One study (22) reported an adverse initial effect on mental and motor skills which disappeared in a short time. On the other hand, discontinuous noises were revealed to be more disturbing.

The annoyance effect of unwanted sounds might be expected to depend largely on the individual differences of people—one man's "music" may be another man's "poison." But, in general, subjects exposed to intense noise for long periods, and noises in the middle and higher frequencies of the audible range, reported they felt more irritable than normally. However, the feeling of irritability did not necessarily limit the efficiency of their performance.

Effect of Noise and Safe Performance

It is interesting to speculate on the effects noise may have on a worker's safe performance. This relationship, if it exists, is important to the investigators concerned with discovering the "Why's" and "How's" of accidental loss causation and its control. Certain possibilities indicating such a relationship may be considered evident in the fact that speed of response and accuracy of performance have been shown (24, 25) to be related to accident causation. A relationship between noise and speed and accuracy of performance has been indicated (26, 27), but it is suggested that further research be conducted before conclusions can be drawn.

Whatever relationship may be shown eventually between noise and safe performance, it is certain that noise has an influence on safety where it interferes with the workers' ability to hear established warning signals or to recognize such changes in the normal sound of certain machine operations that would presage impending hazard to the machine or its operator. For the present, there have been no expressions of recommended noise limits for the maintenance of safe performance environments, nor is there any evidence that consideration is being given the possibility of this factor.

Speech Interference From Noise

The masking effect of noise on communication is a most important phase of the noise problem. It may be responsible for industrial-production interruptions, delays, and other general inefficiences resulting in costs far in excess of any single overhead expense. However, in this instance, some satisfactory criteria have been established.

Speech sounds exist in the frequency range of from 200 to 6000 cycles per sec (cps). However, it is convenient to use only the three frequency bands, 600 to 1200, 1200 to 2400, and 2400 to 4800 cps. The arithmetic mean of the sound-pressure levels for each of the bands gives a quantity known as the "speech-interference level" (23).

For example, a manufacturing plant may be found to have sound-pressure levels in the 600 to 1200, 1200 to 2400, and 2400 to 4800-cps bands, approximating 61, 75, and 63 db, respectively, for each band. This would give a speech-interference level of 66.3 db.

Speech-interference levels for men with average voice strength, using words not necessarily easy to understand, are given in Table 1.

Table 1[a] Maximum Speech-Interference Levels in Db for Reliable Conversation at Varying Distances and Voice Levels

Distance, ft	Voice level (db re: 0.0002 dyne/sq cm)			
	Normal	Raised	Very loud	Shouting
0.5	71	77	83	89
1	65	71	77	83
2	59	65	71	77
3	55	61	67	73
4	53	59	65	71
5	51	57	63	69
6	49	55	61	67
12	43	49	55	61
24	37	43	49	55

[a] Source: "Handbook of Noise Measurement," by A. P. G. Peterson and L. L. Beranek, Cambridge, Mass.: General Radio Company, 1953, p. 74.

It should be noted that Table 1 is based on the assumptions that there are no sound-reflecting surfaces close to the speaker, that there is only one speaker and he is facing the listener, speaking material not already familar to the listener.

But to return to the speech-interference level found for the manufacturing plant in the example, referring to Table 1, it will be seen that the determined speech-interference level of 66.3 db would make conversation relatively difficult unless very close to the listener or speaking at an elevated voice level. The table indicates that the maximum practical speech-interference level that may be tolerated would be 89 db.

It is interesting to note that 89 db is approximately equivalent to the lower limit (90 db) of the range reported by Sterner's inconclusive survey (18) of the noise level which if surpassed for even brief periods would result in hearing damage. It also falls in the upper third of the same survey's reported range for a single over-all level which would be safe for continuous exposure. It may well be that when additional carefully prepared studies are completed in the three areas on which the noise-man relationship has a bearing—hearing damage, psychomotor effects, and communication interference—it will be seen that basically the same limits will effect a satisfactory condition for each.

Noise in industry may then be shown to be related to production factors, and criteria for its control might be set "positively" in terms of what is needed for optimum production, rather than "negatively" as a means for reducing the possibility of liability claims.

Calm Approach Necessary

Regardless of how soon such a relationship is shown—if it ever will be—there must be for the time being an unblinking watchfulness over the information presently available. There cannot be allowed for acceptance any so-called criteria unless they are solidly founded and until they have been analyzed thoroughly and, if possible, tested.

Noise, because it is familiar to all and often annoying to most, has become a subject that many sensationalist writers choose to exploit. Noise is a problem for anyone who is responsible for its presence and the people who must listen to it—that is undeniable. But it is possible that when complete data are available, it will be found that the subject is somewhat less the physiological and psychological sensation that it has become. Therefore, until it can be clearly and unequivocally determined what the limits of noisomeness for noise might be, it would be best to approach the subject calmly, objectively, and quietly.

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Hydraulic Accumulators for Heavy-Press Operation

Basic Types of Accumulators, Auxiliary Components, and Data on Heavy-Press Installations

By A. F. Welsh

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HYDRAULIC-ACCUMULATOR systems played an extensive part in the development of the hydraulic press. Although the Englishman, Joseph Bramah, developed the first press in 1795, hydraulic presses were not used extensively until about the middle of the nineteenth century.

Development of Hydraulic Accumulators

The invention and application of the first hydraulic accumulator is attributed to Sir William Armstrong in 1850.[1] He founded the company now known as Armstrong Whitworth. This accumulator was a development of the air vessel of Ctesibius, 2000 years before. By 1865, Tannett, Walker & Company, Ltd., of Leeds, had constructed 18 hydraulic presses, using dead-weight accumulators. The desirability of other types of accumulators was acknowledged, and as early as 1888 we have evidence of the use of air-piston-type accumulators. The Bochum press, patented by Fritz Baare, used a piston-type accumulator in connection with its hydraulic system of 600 atm pressure. About the same time Prött and Seelhoff patented their pneumatic hydraulic press and system, using the air-piston accumulator. One of the earliest successful air bottles on record was the 60-psi prefill system used in England in 1884 by Davy.

Air-bottle accumulators slowly progressed from that time to the large high-pressure systems in use today. It is difficult to establish which was the first high-pressure air-bottle-accumulator system in the United States. However, one of the earlier installations was made by Baldwin-Lima-Hamilton in 1932. This station was used for operating 85-ton die-casting machines at the plant of the Ternstedt Company. The station consisted of two 29-gal-capacity bottles, which were charged with nitrogen and operated at a working pressure of 1500 psi. Basically, the hydraulic accumulators in use today are the same as those used in the early stages of hydraulic-press development.

The primary purpose of a hydraulic accumulator is to supply instantaneous and peak demands for high-pressure liquid, and reduce the size of the pumping equipment by using the time in between press requirements to replenish the accumulator. A simple illustration of this is shown in Fig. 1. In addition, accumulators help in the control of the flow of the pumping equipment and, in the case of the air-loaded type, a certain amount of cushioning of hydraulic shock is provided.

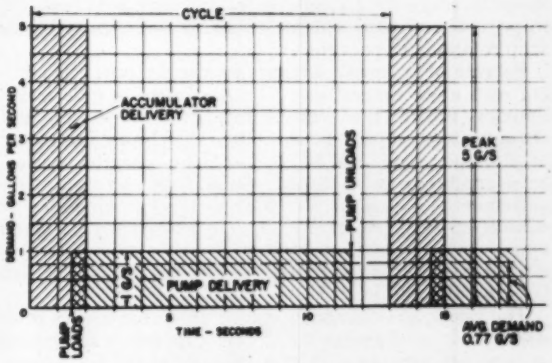

Fig. 1 Hydraulic-demand versus pump-delivery chart

Basic Types of Accumulators

There are three basic types of accumulators—weighted, air piston, and air bottle. The trend today is toward the air bottle, especially for the larger sizes. The weighted accumulator, often called gravity or ballast type, is a simple device requiring no auxiliaries. It has the advantage that the pumps can be controlled by a simple float or limit switches. Another advantage is the fact that when starting the hydraulic system the working pressure of the system can be obtained as soon as the piping is filled and the accumulator is raised off the blocks.

The air-piston or intensifier type, as it is called occasionally, reduces much of the shock caused by the inertia of the ballast weight. In addition, it does not require a massive foundation. An inexpensive air compressor usually rated for a maximum of 250 psi can supply

[1] "Highlights in the History of Machine Hydraulics," by H. G. Conway, *Machine Design*, vol. 22, May, 1950, p. 125.

Contributed by the Hydraulic Division and presented at a joint session of the Hydraulic and Aviation Divisions at the Annual Meeting, New York, N. Y., November 29–December 4, 1953, of THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Condensed from ASME Paper No. 53—A-128.

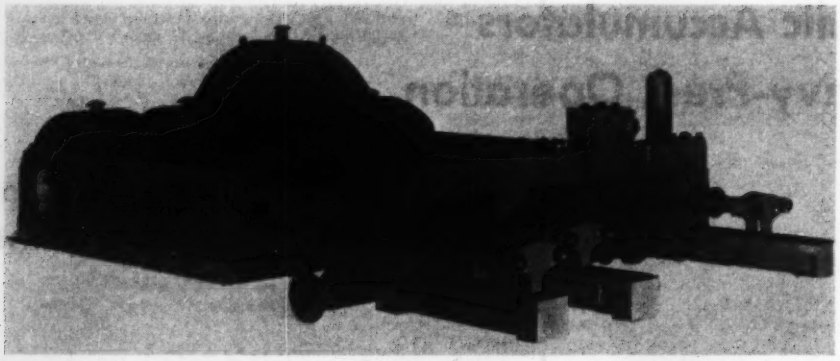

Fig. 2 24-in-stroke, horizontal, triplex-plunger pump with suction-valve unloaders

the air to load the piston. An auxiliary air receiver about 10 times the size of the piston chamber is supplied to provide sufficient volume of air to limit the pressure drop to about 10 per cent.

Because of its many advantages the air bottle is coming into more general use. Its flexibility is practically limitless within the pressure rating of the vessels and the charging compressor. Air bottles can be used singly or in multiples and can be operated in parallel, series, or a combination of both. Should the hydraulic requirements increase or decrease, bottles can be added or subtracted with relative ease, if consideration is given when the system is designed. In this connection, it is well to arrange the system so the bottles can be isolated for inspection.

The air or gas charge in the accumulator makes it an effective surge chamber if properly situated in the piping system and minimizes hydraulic shock and pulsations. Usually the charging medium is air, but an inert gas can be used if the hydraulic fluid is combustible. Most large hydraulic systems use water with a small percentage of soluble oil.

It is of extreme importance to have a water table of sufficient depth at the minimum level in the bottle or bottles to prevent the loss of the air charge. This depth can vary with the type of service, as a liquid-demand characteristic causing a high-velocity discharge from the bottle requires a larger body of residual water than a long slow draw.

Ordinarily, the amount of air that has to be added to a system after it is in operation, because of leakage and absorption, is relatively small. In some instances the compressor does not have to run more than 1 or 2 hours a week. Therefore, when selecting a charging compressor, a compromise has to be made in the interests of economy. Often the size of compressor selected is such that 100 to 150 hr will be required for the initial charge. It will be seen that the loss of a large amount of air may require shutting down press operations for a number of hours until the bottles can be recharged. Consequently, the cost of "down time" should be evaluated in the selection of a compressor.

Operation of Accumulators

To prevent the loss of the water and air charge from the bottle in the event of a line break or a valve's sticking open, an automatic safety shutoff valve is usually installed near the accumulator outlet. This valve is operated by a low-level or pressure switch and stops all flow from the accumulator if the level nears the danger point.

The ratio between the volume of air and water in air-bottle systems varies considerably, anywhere from 2 parts air to 1 part water to 8 parts air to 1 part water. The greater air-water ratio provides a smaller pressure drop per gallon of water withdrawn.

Usually larger systems can use a higher air-water ratio as the minimum volume of water necessary to prevent air loss is a smaller proportion than it would be in a smaller system having the same discharge velocity. Multiple-bottle systems in series operation lend themselves to the use of a minimum residual-water volume.

Pressure and liquid level can be maintained in an air-bottle accumulator by means of pressure governors or level controls, or a combination of both. Control requirements vary in most instances; the controls load and unload the pumps, shut down the pump or pumps in the event of overpressure or high level, and close the safety shutoff valve in the event of low level or low pressure. In addition, alarms can be sounded to warn of low level or pressure and high level or high pressure. In connection with operations such as piercing it is necessary that the low-level alarm sound when there is still sufficient water in the accumulator to withdraw the die before the safety shutoff valve closes, thereby preventing its being frozen in the metal.

Pumps, Air Bottles, and Compressors

The major portion of the pumping equipment furnished with the larger presses in this country has been of the reciprocating-power-pump type. However, forged-barrel diffuser-type centrifugal pumps also have been used. The preference of the press builders for the power pump has been due to its higher efficiency.[2]

Some of the larger installations include a number of 24-in-stroke, horizontal-triplex, double-acting power pumps driven by either 1200 or 1500-hp electric motors, through a single reduction of gears. The pumps operate at about 75 rpm. The liquid cylinders are made from steel forgings; this type of pump is shown in Fig. 2.

Another type of reciprocating pump for this service

[2] "The Design and Construction of Large Forging and Extrusion Presses for Light Metals," by M. D. Stone, Trans. ASME, vol. 74, 1952, p. 10.

Fig. 4 Fabricating a forged seamless air-bottle type accumulator

is the vertical multiplunger power pump shown in Fig. 3. These units are driven by synchronous motors attached directly to the crankshaft and operate at 300 rpm.

Large air bottles being manufactured today can be of forged, solid-welded, or laminated construction. Usually the type of construction selected is based on economic considerations. Fig. 4 shows a forged bottle being machined. This is for the 50,000-ton Mesta press.

For large high-pressure bottle charging, multistage air compressors are used. Fig. 5 shows a typical booster unit, which is of the 3-stage water-cooled design. This compressor is suitable for 4500 psi; it has a capacity of 6.75 cfm and is driven by a 30-hp motor.

Air Force Heavy-Press Program

When heavy presses are mentioned today we immediately think of the large forging and extrusion presses being developed by various manufacturers for the U. S. Air Force. The first press to be put in operation under this program is the 14,000-ton extrusion press designed and built by Schloemann, A. G., Dusseldorf, Germany. This unit was installed at the Lafayette, Ind., Works of the Aluminum Company of America. The accumulator station for this press also was designed and manufactured in Germany, under specifications which assure conformance to the applicable ASME Code and the code of the State of Indiana.

The accumulator station consists of 30 interconnected vessels arranged in two parallel rows of 15 each. Four of these vessels are designed for air-water service, the balance for air only. With the exception of the number and location of openings, the vessels are identical, regardless of the type of service for which they are intended. They were designed for 4500 psi operation, tested to 6750 psi.

The 26 vessels for air service (1835 cu ft total) are piped to a common header, with the piping and valving so arranged that groups of three vessels may be isolated from the balance of the system for maintenance purposes. This common air header in turn is connected to a manifold which opens into the top of each of the four air-water vessels. The bottoms of the four air-water vessels are connected to a water manifold, through which the accumulator receives and discharges its water supply. The level-control column is connected to one of the air-water vessels.

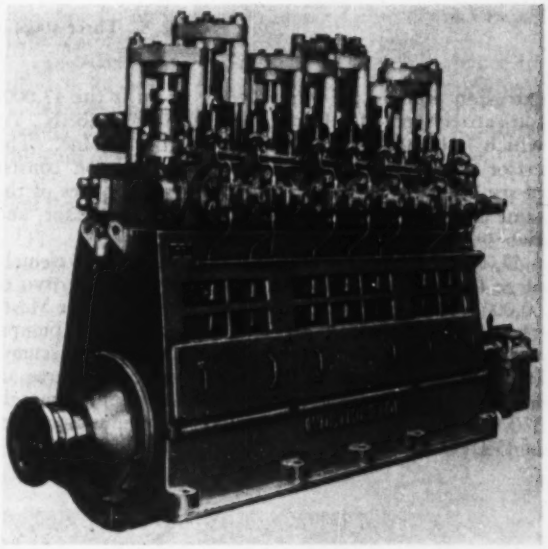

Fig. 3 6-in-stroke, vertical, septuplex pump with suction-valve unloaders

When the accumulator contains its full charge of water each of the air-water vessels contains approximately $^{5}/_{6}$ water and $^{1}/_{6}$ air. The accumulator water is supplied by four 233-gpm pumps, with pump loading and unloading controlled automatically by means of float-operated mercury switches incorporated in the level-control column.

12,000-Ton Press for Curtiss-Wright. Another large

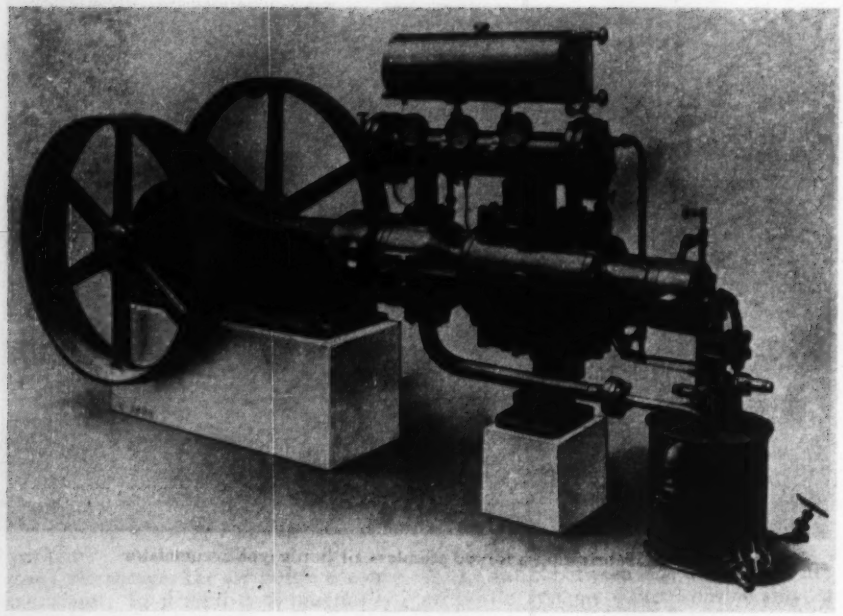

Fig. 5 Three-stage horizontal air compressor

extrusion press in the Air Force program is the 12,000-ton-capacity unit for Curtiss-Wright at Buffalo, N. Y., which is being built by Loewy-Hydropress, Inc. The major components of the accumulator station consist of six 350-cu-ft air bottles and two water bottles of the same capacity, one 4-stage 4500-psi air compressor, and two 490-gpm 4500-psi pumps.

50,000 and 35,000-Ton Presses. There are four extremely large forging presses in the Air Force program, two of 50,000 tons capacity and two of 35,000 tons. The Mesta press will be powered by two triplex-plunger pumps, with a capacity of 490 gpm. Its high-pressure accumulator system consists of one water bottle and three air bottles; all are forged seamless vessels of approximately 3500 gal capacity each, designed for a maximum pressure of 4550 psi.

35,000-Ton Press for Aluminum Company. United Engineering and Foundry Company is building a 35,000-ton forging press for Aluminum Company of America at Cleveland, Ohio. This press will be equipped with six bottles, each having a capacity of approximately 2500 gal. Five 700-hp, vertical, 7-plunger pumps power the system, and they are controlled by magnetically operated level controllers.

Loewy Presses of 50,000 and 35,000 Tons. Wyman-Gordon Company, Worcester, Mass., will operate the 50,000 and 35,000-ton Loewy presses, and their combined hydraulic needs require a tremendous accumulator station, Fig. 6. In this station will be seven triplex pumps having a total horsepower rating of 10,500 (Fig. 6 shows only four of these pumps). All major compo-

(*Continued on page 581*)

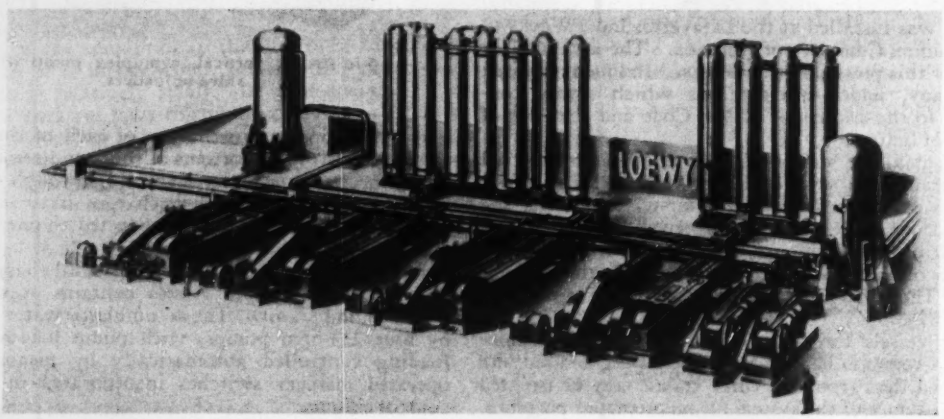

Fig. 6 Artist's conception of large accumulator station to be installed at Wyman-Gordon plant, North Grafton, Mass.

How to Sell Your Ideas

The principle of selling that most intangible of all commodities—ideas—is presented from the experiences of master salesmen

By Phil Carroll

Maplewood, N. J. Fellow ASME, Chairman, ASME Management Division

ARE you thinking of selling your boss on the idea that you deserve a raise? Are you trying to sell an idea that is new or untried? Are you hoping to sell a change where you have some precedents to go by? Does your proposal affect an isolated problem or does it involve a whole series? Will it cost a small amount or many thousands of dollars? Will it upset the habits of a few people or a whole plant?

Engineers Must Sell

With all these considerations, we cannot escape the fact that we, as engineers, must sell. Sometimes we are the creators of new things and new ideas. Perhaps more often, we are trying to sell ideas that others have developed or new applications of old ideas. Our livelihoods and careers depend upon how successfully we can sell these inventions, developments, or applications.

These new things we come up with are ideas at the start. Hence we have to know how to sell ideas before we can get approvals to make models, buy gadgets, or install systems.

You dare not shrink away from selling by saying, "Salesmen are born. I'm an engineer. I can't learn to sell." The experts say this isn't so. The biographies of the "sixty great salesmen" whose "most significant" sales are compiled in one book show that many did not complete university training (1).[1] Some were educated in law, medicine, accounting, art, letters, and business administration. At least 20 per cent of these outstanding salesmen received engineering degrees. Many worked in engineering for a considerable time before moving upward in industry.

Ideas Are Intangible

According to John M. Wilson, "You can't sell if you don't know (knowledge)—but knowledge is worthless unless you apply it and really work (Willingness to Work Hard)—and your work becomes a pleasure if you can sell yourself on the interview (Ability to Sell Yourself) so your prospect will listen with an open mind to your sales presentation (2)."

These same rules apply to selling ideas. But often there is one big difference. Products are tangible. In contrast, ideas are intangible. Common examples in industry are better methods, work measurement, wage incentives, job evaluation, and supervisory development.

If your idea is practical, an argument such as, "Our business is different" is an excuse—not a reason. Such comments are examples of "resistance to change" (3, 4, 5).

Sales experts give us two principles for selling ideas. The first is that each sale is a special project because you may not know how your idea relates to your buyer's experiences.

The second principle, and the chief one, is that selling ideas is an educational process. It involves giving to your buyer the knowledge, or experience, so that he can "think" along with you (6). He may come out with a different answer. But that is another phase of selling.

Get the Facts

First, you must "Get the Facts." Your idea must be "practical," as the industrialist looks at it. It should pay its way. It should have more advantages than disadvantages (7).

One detail is important. For example, the amount of "saving" has varying significance according to current conditions and to individual buyers. And also, you sometimes get better results by talking percentages rather than amounts. But the point is to present your cost-saving arguments in the form that will register most effectively.

Be Sure You're Right

Naturally, you recognize the need for making recommendations that are "practical." You should know beforehand if your idea is not economically sound under existing conditions. Primarily, you want your company to progress forward—not backward. But also, you should make every effort to avoid going off "half-cocked." To be sure, everybody makes mistakes who gets things done. Yet, your ability to sell ideas is often related to your reputation for successes. Hence you want to minimize your mistakes.

Ironically, thorough preparation of your selling arguments can create in you too much enthusiasm. You may work yourself up to such a high pitch that you will sell too vigorously (8, 9).

If you do you may fail to give your buyer a chance to be heard. You may not listen for objections. You may try to overcome with words those objections you do hear. You should know all the angles to your pro-

[1] Numbers in parentheses refer to the Bibliography at the end of the paper.

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posal. You may know a way to save "millions." But don't get too far ahead of your buyer in his educational process.

Planting Seeds

Master salesmen tell us that proper timing is vital in successful selling. One type of advantageous timing is "Planting the seed and then watering it." If you know about how long it will take your seed to grow up and bear fruit, then all you have to do is plant your seed in time. Water it on every appropriate occasion. Usually, the fruit will be ready when you want to pick it.

There is another twist to this method. You can pass along news items, articles, and books containing statements of principle made by those who are supposed to know. Do not underestimate the halo effect of the printed word.

In a different way, you may gain your point sometimes by bringing your boss to professional-society meetings. This method has proved fruitful. For example, in the discussion period, someone may ask a specific question. He thinks he knows what the answer will be. Maybe he has heard it before or read it in one of the speaker's articles. He asks the question, however, because he has brought his boss along to hear the answer he expects to be given. That's all right. It is perfectly legitimate.

Ask Questions

Perhaps the key to successful selling is found in the reverse of John M. Wilson's comment that "salesmen do not ask enough questions" (10). Many successful salesmen make this point and go on to insist that you listen to the answers your questions bring out.

We know that it is rude to interrupt. But their point goes beyond politeness. They stress the importance of listening to objections and seeking objections so you can tell what progress you are making. Are you being understood? Are your points being digested?

Besides, if you listen, you might learn something (11). Ask questions. Listen to objections. You may find out that you have overlooked an important detail.

Avoid the No

Suppose you have listened carefully to the objections raised by your buyer. Assume also, that you think you have good answers for all of them. Now, you want to be very careful (12).

When you detect signs of a final "No" coming up over the horizon, it is good tactics to withdraw. You can state that you want to get more information about any of the seemingly vital objections he has raised.

Postpone further discussion to avoid a definite "No." If you get a "No" answer then you have to pour water uphill to get back where you started. On top of that, you have to go through a face-saving operation to get most people to admit they were wrong.

At this point suppose you have avoided a positive "No" and you think you are equipped to overcome all objections. Next, perhaps, you will have to contend with suggested changes in your proposal or alternatives. You may be faced with what many call a compromise (13, 14, 15).

It is suggested that you look at objections as indicators of improvements upon your basic idea.

When you can find ways to utilize your buyer's ideas, you gain his "participation." He becomes a party to the new project. This is a very desirable "condition of sale" (16).

Often your buyer's pride or interest is vital to the success of your proposal. For instance, suppose you suggest a new method. Chances are that your improvement must be made to work by someone else. That person can cause your improvement to fail repeatedly if he isn't interested in you or your idea.

Where to Start

That brings in the question of how many other people need to be "sold." Naturally, the immediate supervisor must go along. Some above him must approve, depending upon the over-all effect or the amount of money to be spent. Big changes involving policy usually require that you get top-management approval. However, many of your ideas can be sold at the bottom. For example, to sell a foreman before going to his boss, and so on, has two advantages. First is the necessity to prove your idea is a good one. For that, you need the help of persons who will directly execute your plan. They are much more apt to carry out your idea to a successful conclusion if they really do improve upon it and buy it than if they get instructions from on high to "give it a trial."

The second advantage is that normally you have your best selling reasons at the point of use. Perhaps you can show a foreman an important saving in cost or gain in production. Obviously you would stress the gain that would best serve him at the moment.

Gain—Selfishness

As to the question, "What do I get out of it?" it might be said that to sell ideas, you must have a professional attitude. Certainly, you have to think more about having your idea utilized than you do of who's going to get the credit. You are looking more to a reputation as a "man who gets things done" than you are to who makes yardage.

Frank Bettger gives a simple rule that seems to summarize in one sentence this subject of how to sell your ideas—"Try to find out what people want and then help them get it" (17).

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Increasing the Opportunities for Automaticity

By M. L. Hurn

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The author's intention is to stimulate interest in the possibilities of automation as applied to the manufacture of products which on the surface do not seem to be adaptable to the principles. Managerial functions of concept forming, planning, and weighing of risks enter any consideration of developing a successful automatic manufacturing operation.

REMARKABLE ingenuity has gone into the design of automatic operations both for shop and office, according to published reports. These unusually fine demonstrations of skill in industrial engineering and machine design are entirely praiseworthy. They illustrate again the ability of men when given concepts about which to work and build.

However, if attention is turned to the matter of concepts, there is considerably less cause for satisfaction. It seems rather evident that in the realm of opportunity-making concepts, the wonderful things reported are occurring only in those segments of industrial activity in which the opportunities are not being created but already exist. This is not a commentary on technical skills but upon managerial skills of planning and conceiving—of creating opportunity for technical skills.

Creating Opportunity

Two examples, while somewhat extreme, will illustrate the point.

There is no need to ferret out the fact that beverage bottling can be automatic if technical skills are available. In most cases there is ample volume, a high degree of repetition, either in the form of long runs of one product or of a few products requiring the same processing activity, and a reasonable amount of manual-labor content. The things that must be controlled in such an operation are also not too difficult to visualize. In effect, this is a ready-made situation.

At the other extreme there is another typical operation that may make and have listed for sale a half-dozen product lines, each consisting of several thousand distinct models. Such a business also may have a large aggregate volume, as indicated by an order rate of upward of 10,000 or 20,000 units of product per week. In this instance the opportunities for going automatic are not obvious. On the face of it, this appears to be a business in which the average order rate is about 2 units per model per week.

If we superimpose upon this complexity a national sales organization ordering in various-sized lots and with a variety of product mixes from a number of locations, the opportunities for going automatic on a very large scale seem fairly dim. As if in proof of this statement we also read little about either large-scale mechanization or automation in this kind of an operation. What is required here first is research in the operation itself for concepts that create the opportunity.

The most common concept of high, repetitive, and continuous volume of the finished product is not obvious in this case as it is in the case of beverage bottling. We are speaking here of possibly 10 or 20 thousand units of product spread over something like 12,000 specific models. A more subtle approach is therefore required in which an analysis may have to be made several levels down below the finished product to ascertain if the environment exists or can be made to exist. Most of these methods are not new. What may be novel is the use of all of them if required and taking action as a result across all functional areas of a business, not just manufacturing alone. For purposes of discussion these research activities can be defined by levels, beginning with level 1, as investigations of the finished product.

Statistical Groupings of Finished Product—Level 1

The first approach is to examine the distribution of the total volume by families of finished products and by individual models. Obviously, the volume is not evenly distributed over all models and, if the situation is examined for some reasonable period of time, as a quarter or a year as shown in Table 1, a distribution might well be expected. In this case two model numbers represent 81.7 per cent of the annual volume and 6 models 90.8 per cent. It may be that the first two models in themselves represent sufficient value to permit their consideration for automatic handling alone. Of course, the problem is not solved then. There also must occur a sufficient constancy of use to keep a given quantity of specialized manufacturing equipment operating at a sufficiently continual rate to justify the installation of the equipment.

Fig. 1 is illustrative of a typical flow of orders on a month-by-month basis for a year in this kind of a business. The order rate varies from 2000 to 500 units of product per month. On the face of it, this kind of variation is not conducive to the use of specialized equipment. The utilization could vary from 25 to 100 per cent in the year in question. It would rather suggest putting many products on the machines to level out the peaks and hollows.

Actually, the process of manufacturing and filling orders is a cumulative process. When the order rate is

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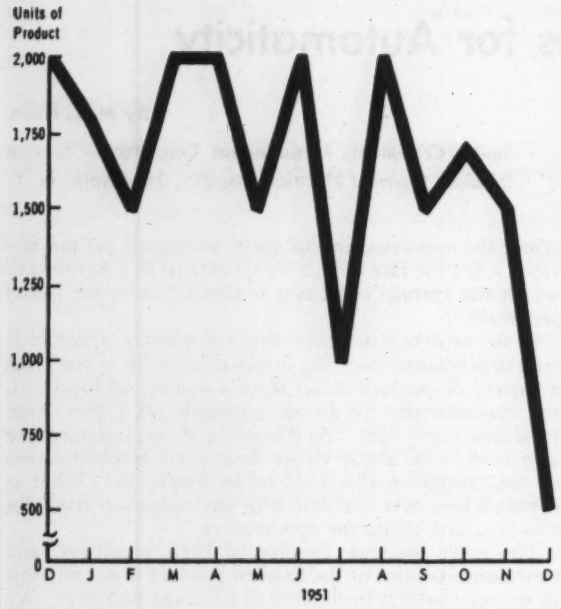


Fig. 1 Typical orders-received plot by months for one year

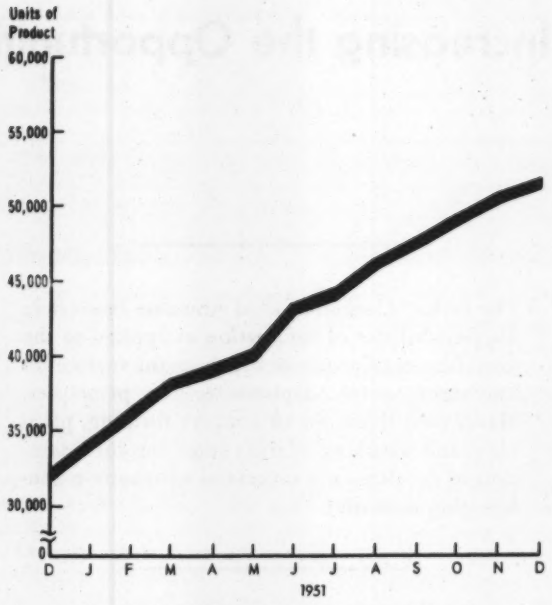


Fig. 2 Cumulative plot order rate of Fig. 1

higher than plant capabilities, shipping promises are made longer, e.g., as a backlog is accumulated. When orders are lower than plant capabilities, finished stock is accumulated. The same line of reasoning also can be applied to the problem of the specialized line of machines for a specific product. Assuming a constant rate of output consistent with reasonable pay-off, what backlogs of orders and what surplus stocks might be accumulated and for what periods for the product in question?

Fig. 2 shows the plot of the same order rate as in Fig. 1 but on a cumulative basis. In this case the individual slopes are the monthly order rates. It will be observed that on this basis the over-all rate looks as though it were pretty close to being a straight line, sufficiently so at least to provide a basis for managerial decision concerning how much finished stock can be tolerated and also what extended shipping time.

Fig. 3 indicates two possible positions that a management might elect to take. In Fig. 3(*a*) it is assumed that immediate shipment is always required. In this

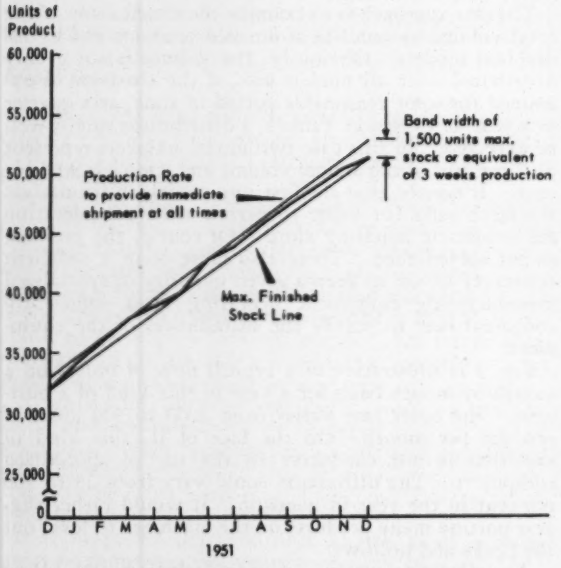


Fig. 3(*a*) Relation of constant production rate based on immediate shipment to orders received

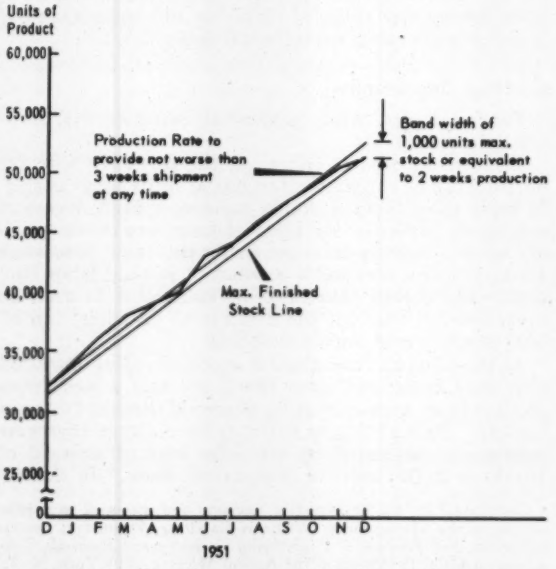


Fig. 3(*b*) Relation of constant production rate based on not longer than 3 weeks' shipment to orders received

Table 1 Distribution of volume by model 1951 8 × 100 line

MODEL NUMBER	VOLUME IN UNITS	CUMULATIVE % OF TOTAL
8×101B	5862	55.0
101A	2848	81.7
101DJ	501	86.4
101BT	181	88.1
101AS	153	89.6
101DK	130	90.8
101C	126	92.0
101E	118	93.1
101G	111	94.1
101AN	84	94.9
101D	81	95.7
101AL	71	96.3
102B	66	97.0
101Q	63	97.6
101BB	36	97.9
103A	27	98.2

Summary:
2 models, 81.7 per cent
6 models, 90.8 per cent

Table 2 Superior pattern of operating mechanism EIIAK for 8 × 100 line

MODEL NUMBER	CUMULATIVE % TOTAL	OPERATING MECHANISM	ACCUMULATIVE % TOTAL
8×101B	55.0	EIIAK	55.0
8×101A	81.7		81.7
8×101DJ	86.4		86.4
8×101BT	88.1		88.1
8×101AS	89.6		89.6
8×101DK	90.8		90.8
8×101C	92.0		92.0
8×101E	93.1		93.1
8×101G	94.1		94.1
8×101AN	94.9		94.9
8×101D	95.7		95.7
8×101AL	96.3		96.3
8×101Q	97.0		96.9
8×101B	97.6		97.2
8×102B	97.9	EIIAL	97.9
8×103A	98.2	EIIAM	98.2

Summary: Operating Mechanism
1 model, 97.2 per cent
Complete 2 models, 81.7 per cent
Models 6 models, 90.8 per cent

Table 3 Distribution of volume by model 1951 9 × 100 line

MODEL NUMBER	VOLUME IN UNITS	OPERATING MECHANISM	MODEL NUMBER	VOLUME IN UNITS	OPERATING MECHANISM
9×100A	7890	EIIAK	9×106A	15	EIIAR
9×101A	3420	"	9×100C	12	EIIAK
9×100AV	1540	"	9×101B	10	"
9×100G	356	"	9×102G	6	"
9×100D	119	"	9×100AJ	4	EIIAL
9×102F	56	"	9×100K	2	"
9×100B	43	"	9×100P	2	EIIAJ
9×100AY	40	"	9×100BA	2	EIIAM
9×107B	26	"	9×100BG	2	"
9×101G	25	"	9×100AJ	2	"
9×101H	22	"	9×100AM	2	EIIAP
9×101D	21	"	9×101W	2	"
9×100BJ	21	"	9×100AF	1	"
9×100N	20	"	9×100BC	1	EIIAL
9×100T	19	"	9×100BR	1	EIIAJ
9×101N	18	"	9×100CF	1	EIIAR

case we accumulate roughly three quarters of a month's stock by year end, with substantially less stock on hand than this during most of the year. In Fig. 3(*b*) it is assumed that 3 weeks' shipping time is acceptable. In this case the year is ended with about 2 weeks' stock while during the year there have been only rare occasions when shipment could be made immediately from stock. This is used merely to point out the possibility of operating at a constant rate with as widely fluctuating an order rate as indicated in Fig. 1. Such a procedure has its risks that must be evaluated. But a historical performance curve such as Fig. 1 need not in itself be a discouragement.

Statistical Grouping of Major Components—Level 2

Quite frequently in an operation of this type it is discovered, usually by accident, that a certain subassembly or part has a sufficiently large usage, to indicate that it applies to more than one model of finished product. As a result, those parts or subassemblies are produced independent of analysis of incoming orders on some sort of trend basis. Usually this trend is only vaguely associated with the specific models of finished products and the finished-product order rate.

This accidental approach suggests that a planned analytical examination of the array of products from the existing engineering documents might lead to a positive base for obtaining sufficient volume and value in components to lead to an environment congenial to automaticity. This constitutes a second level of analysis.

For example, the array of products illustrated in Table 1 on analysis indicates, in terms of volume for the basic operating mechanism, a pattern superior to the array of finished products itself. This is shown in Table 2. Two things occur as a result:

1 There is a larger-volume base than in the case of the finished product.

2 There should be a great constancy of requirements for this component since it is used on not one model but 14.

This type of approach to the mechanized machine or line is not without its problems; one of these problems is of course the necessity for matching the components so made with other parts manufactured by traditional methods. This presents an interesting inventory-control problem which is beyond the scope of this paper.

Parts to Families of Models—Level 3

In Table 2 there are two mongrel operating mechanisms EIIAL and EIIAM. The question naturally arises as to what respect they differ from EIIAK. In Table 1 there are two basic models 8 × 101B and 101A representing 81.7 per cent of the volume, yet 14 models in the total array use the same operating mechanism EIIAK, so that the same question arises with respect to the finished models. What are the differences and why?

It so happens that the differences in the mongrel operating mechanisms EIIAL and EIIAM and EIIAK are operating voltage. The mechanical mechanisms are the same; the voltage of the energizing coils alone differs. This suggests that the mechanical structures for EIIAL and EIIAM might well be made along with EIIAK.

When we examine the finished models themselves, quite frequently it is found that the differences are in the finishing operations, different combinations of the same parts, and often human error. It is not uncommon to find 75 per cent of the parts and 90 per cent of the value of a product array are in common parts.

Referring to Table 3 for a moment, it will be noted that this line 9 × 100 also uses the EIIAK operating mechanism as does the 8 × 100 line. A cumulative effect is obtained frequently across existing product lines as well. It is found too that such patterns exist but are not developed completely, largely because people have not taken the time to look at the totality of parts at one time and in one place to determine where they are used across the entire array of models being built. If nothing else, such analytical work suggests partial redesign that makes doing the work automatically more feasible.

However, the real power in this type of analytical approach, beginning with significantly arranged arrays of finished product and working down to associating these arrays or families with groups of parts, lies in the ability to relate directly a sales forecast or the going order rate to parts. In this manner it is possible to ap-

praise parts against an order rate and finished-product mix for determining the potentialities in volume and repetition by parts or groups of parts when these factors are not apparent at the finished-product level.

Creating the Climate

Here are then at least three levels at which analytical work upon the operation itself can be done. They are all concerned with discovering if there is something in the fundamental nature of the business that will provide a climate for doing work automatically. Obviously, they also suggest rational ways of making this climate more suitable.

Any evidence of a pattern, even if incomplete, suggests that the business has or is evolving in certain directions. Where some of these things occur, the natural tendency is to help the situation along, if it can be done sensibly.

For example, if we observed a situation like that indicated in Table 3 the natural tendency is to ask marketing people to eliminate some of the offending models. You will note that it is in those sold at any annual rate of 2 or 3 that the principal variations also occur in the operating mechanism. If this pattern is observed over a period of years the arguments become even more compelling. Yet it must be admitted that this is the hardest level at which to assist evolution. Invariably it appears that the entire structure of the business hinges upon these items that sell at an annual rate of 2 or 3. In spite of this emotional difficulty, there is provided by this method a powerful lever for getting change toward the simpler started.

A more fruitful area is engineering design. There are people who suggest that radical changes may be required in design before the automatic factory is possible. In part this may be true but personally the author believes these are people who look at the finished product only and do not plumb the depths to subassemblies or groups of parts. As indicated previously, when testing a significant group of parts, significant in the respect that they are tied together by a common voltage level, kilovolt-ampere or horsepower rating, interrupting duty, or the like, one discovers minor variations from a pattern. For example, winding insulation for coils was being examined. The pieces of insulation were grouped under a combination of significant factors including voltage level, winding-mandrel size, over-all external build, layers per coil, and so on. It was discovered that the pattern for specific pieces was completely random, as illustrated in Table 4. On second inspection it was found that the variations were insignificant fractions of the total dimensions. It also was found that in those instances where insulation for the inner layer was longer than one might have supposed, the insulation for the second layer was shorter, and so on.

In discussion with the designers it soon was discovered that they had no concept of the manufacturing and inventory problem they were creating. Seeing the random nature of the results, where any person would have suspected order to exist, they were most willing to change. They were willing to admit that the random lengths resulted from their failure to comprehend other costs than material cost and the feeling that the workman would trim the insulation anyhow while winding.

This is design change too, but by increments. Despite the fact that this represented only a small change in design it created a much more congenial atmosphere for the manufacture of insulation. In fact, by assuming the winder would trim, the engineers actually were preserving an environment for manual work.

Table 4 Coil insulation

COIL SPECIFICATION	491-1	465-3	465-2	491-2	655-1	347-1	347-2	485-1
Voltage Class	7200	7200	7200	7200	7200	7200	7200	7200
Mandrel Size	3"	3"	3"	3"	3"	3"	3"	3"
Coil Height	5	5	5	5	5	5	5	5
Coil Build	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
Layers Per Coil	3	3	3	3	3	3	3	3
Layer Insulation								
Layer 1 KP 5"x	10	10 1/4	10 3/8	10 1/8	10	10 3/4	10 1/4	10 3/8
Layer 2 KP 5"x	12	11 3/8	11 3/4	11 3/4	11 7/8	11 5/8	12	12 1/8
Layer 3 KP 5"x	13 7/8	14 1/4	13 3/4	14	14	13 7/8	14 1/8	14 1/8
End Insulation								
Layer 1 PB ½"x	10 1/8	10 1/8	10 1/4	10 1/4	10 3/8	10 1/8	10 3/8	10 1/2
Layer 2 PB ½"x	12	12 1/8	11 3/4	12 1/8	12 1/4	11 7/8	12	12 1/4
Layer 3 PB ½"x	14	14 1/4	14 1/8	13 7/8	13 3/4	14	13 7/8	14

The absence of patterns or the existence of partial patterns should be accepted as an opportunity for directing effort toward the creation of the correct environment, not as a deterrent to going automatic.

The Concept of Value

In the earlier examples the concept of volume has been stressed heavily as an environmental factor. Volume only is not necessarily a good guide. A more definitive guide is value which in general terms is a product of volume and the labor involved in making a given part or subassembly manually. Value has a two-edged effect. In some instances it may discourage the automatic approach even when volume is available; in others, it may encourage the use of this approach even though large volume is not available.

Let us assume that we have a part on which the annual usage is one million. If this is a simple punched part that can be produced at the rate of 100 per minute it is quite likely that a specialized machine would not be in order as it could provide the annual requirement in roughly 20 working days. More than likely this would be planned for a general-purpose press with effort perhaps directed toward simplifying the setup. In this instance, although volume is high, the aggregate value is low when measured in dollars or time.

By contrast there may exist a low-volume item with high value as a result of the labor content, both running and setup, that may well dictate a continually operated specialized process.

The absence of volume alone does not necessarily indicate that the environment is not right for going automatic. In fact, there is available a reasonable body of operational-research mathematics that may assist in making such determinations.

Concept of the Value of Control

Early in this paper it was suggested that the large-volume great-variety business that we are using as an example might show the following characteristics:

1 Groups of significant parts that can be associated with specific models of finished product.

2 A variable order rate in which the degree of variation was sufficiently small to merit taking the risks of operating at a fixed rate for long periods of time.

Another pattern that may be discovered is as follows:

1 Groups of significant parts that can be associated with specific models again are discovered.

2 The degree of variation in the order rate is too great to risk operating at a constant rate or the product mix varies significantly.

This type of pattern suggests the general-purpose shop. However, as was pointed out earlier, in analyzing models against parts, it is discovered frequently that there are certain parts, usually of limited number, which really define the product family. On these definitive parts there is no opportunity to play with the laws of chance, assuming that if one family is low, another will be high. These definitive parts must be available; otherwise the operation lacks flexibility. These parts may be of only relatively high value.

In this case the managerial decision for automaticity may be based upon its use to obtain a planned type of flexibility. The arithmetic in justification in this case is concerned with the cost of idle machines against loss of business owing to inflexibility and the cost of carrying inventories of these definitive parts in sufficient quantity reasonably to cover the expected band widths of order-rate variation.

Bringing Tools to the General-Purpose Machine

Another type pattern may develop in this type of business. In this case:

1 The parts fall into significant patterns that can be related to models of finished product.

2 The order rate shows a reasonable constancy.

3 The value of individual parts is such as to suggest the ordered accumulation of parts inventory as the most economical procedure.

Here the answer obviously is a shop filled with general-purpose tools and the separation of parts manufacture from assembly operations by a planned buffer of inventory. In this case the constancy of the order rate over long periods, as illustrated in Fig. 3, suggests a fixed schedule for the parts shop, mathematically analyzed for an optimum utilization of the machines at any time.

In this case, although the machine tools are general-purpose, the setups on these machines should pass across them in a regular, planned sequence. This suggests the automation of the setups to the machine rather than the automation of the flow of material to specialized machines.

If one wishes to be just a bit visionary, it seems entirely feasible that the fixed schedules of parts ultimately might be stored on a magnetic-drum memory and that the reader on this computer could send control messages to the conveyers carrying the setups consistent with the preplanned schedule. There is here the problem of losses which in a mature business should be capable of resolution by statistical methods.

Conclusions

The intent of these observations has not been to give a complete and definitive listing of approaches to the problem of automaticity. It is also not intended to create the impression that a way can be found to do all jobs automatically. Its intent is rather to stimulate interest in probing beyond the obvious; to find patterns and relations at one of a number of levels within the operation; to do research in the operation of finding the existing climate in which automatic manufacture is feasible or as the means for creating such a climate without revolutionizing the product or the market; and then to utilize the type of climate discovered in designing the automatic approach.

The desire also has been to show that the problem is not limited to the technical fields of industrial engineering and machine design but that it must include the managerial functions of concept forming, planning accordingly, and the evaluation of risks.

If we will look beyond the obvious and utilize the analytical tools now available, the opportunities for mechanization and automation should be increased surprisingly.

Hydraulic Accumulators for Heavy-Press Operation

(Continued from page 574)

nents of the high-pressure system are shown, also the prefill vessels. The accumulators have a capacity of 350 cu ft each, and have dimensions of 46 in. ID, 64 in. OD, and are 36 ft high. Seven bottles are required by the 50,000-ton press, and four by the 35,000-ton unit. Four pumps are assigned to the larger and three to the smaller press. A spare has been provided for each press.

Probably one of the highest-pressure air-bottle systems in operation in this country on a large press is that at Cameron Iron Works in Houston, Texas. This Baldwin-Lima-Hamilton Corporation press has an accumulator system with a usable capacity of 675 gal and operates at a maximum pressure of 5500 psi.

Conclusion

In conclusion, the author would like to add that should the need for larger presses arise, there is no question that the manufacturers of components for accumulator stations will be able to supply the requirements with ease. At the present time there are pumps available that are 35 to 40 per cent larger than those mentioned in the foregoing. Facilities are available to shop-fabricate an air bottle having a volume of 11,800 gal, possibly greater, and suitable for a pressure of 4500 psi. These facts, together with the possibility of using multiple units, will allow the production of accumulator stations in sizes far beyond any contemplated in connection with the present Air Force program.

Acknowledgment

Of necessity, the information relative to specific installations had to be obtained from individuals in various companies. The author would like to acknowledge the help and co-operation received from R. W. Andrews, Jr., Aluminum Company of America; W. Ehlers, Baldwin-Lima-Hamilton Corporation; F. J. Gleve, United Engineering and Foundry Company; L. Iverson, Mesta Machine Company; J. L. Oberg, The Babcock & Wilcox Company; M. D. Stone, United Engineering and Foundry Company; A. E. Swain, R. D. Wood Company; A. Zeitlin, Loewy Construction Company; and C. W. Boegehold, Worthington Corporation.

Engineers Joint Council

What engineers should know about the Engineers Joint Council—how it came into being, its objectives and background, who belongs to it, and what it is doing for the engineering profession

By T. A. Marshall, Jr.

Secretary, Engineers Joint Council, New York, N. Y.

Organization of EJC

The present Council is composed of 19 representatives of the eight constituent societies in proportion to their membership. Representatives and alternates on the Council must be members of the governing boards of the societies they represent. The presidents of the constituent societies are members ex-officio of the Council. The president and vice-president of EJC and the members of the Executive Committee are elected from among the representatives at the Annual Organizational Meeting to serve for one year. The EJC constitution provides that the president, the vice-president, and the other members of the Executive Committee must each be from a different society.

Engineers Joint Council was organized in 1941 as the Engineers Joint Conference, an organization that grew out of a liaison relationship that had existed between the secretaries of the four Founder Societies (the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, The American Society of Mechanical Engineers, and the American Institute of Electrical Engineers) for many years. The Conference was an outgrowth of the Engineering Council of the National Technical Societies of America formed by the same societies in 1917. The 1917 Council was formed to work with the government on engineering problems involved in developing the automobile, the tank, and the airplane into major weapons of national defense. When the American Engineering Council was formed in 1920, the 1917 Engineering Council discontinued its operations and turned over to the new Council its records, its funds, and its Washington office and staff. Although AEC was abandoned in 1940, the liaison relationship between the secretaries of the Founder Societies continued.

Early in the mobilization immediately preceding our entrance into World War II, the Founder Societies received a number of requests from various governmental activities for information and aid in areas of interest to the profession. It was decided that a more formal organization was needed and the Engineers Joint Conference was established in 1941. At that time it was composed of the presidents and secretaries of the participating societies. The American Institute of Chemical Engineers became the fifth participating member of this Conference in 1942.

As the scope of its activities expanded, the functions of this informal organization became of greater significance than that implied by "Conference." The name was changed to Engineers Joint Council in September, 1945. Representation of the constituent societies on the Council was increased and a formal constitution adopted.

Expansion of EJC

In 1949 Engineers Joint Council, through its Committee on Increased Unity, sponsored a meeting to discuss the development of increased unity within the engineering profession. Out of this meeting, an Exploratory Group with representation from ten other national societies in addition to the five EJC societies was formed. During more than two years of study, the Exploratory Group developed a program and plan acceptable to most of its members that was submitted to EJC in January, 1952.

After considerable public discussion, the EJC constitution was modified so that the first step in developing a unity organization in accordance with the recommendations of the Exploratory Group could be taken. The first modification of the EJC constitution changed the requirements for membership to permit the extension of invitations to additional societies to join EJC and, at the same time, provided proportional representation from its member societies.

The change in the constitution was ratified by the five constituent societies of EJC by Dec. 7, 1952, and on Dec. 31, 1952, invitations were extended to eight additional societies to join EJC. Acceptances were received from

Contributed by the Management Division and presented at the Second Engineering Management Conference, Philadelphia, Pa., March 31-April 1, 1954, of The American Society of Mechanical Engineers. Condensed from paper No. 54—MGT-4.

three: American Water Works Association, The Society of Naval Architects and Marine Engineers, and American Society for Engineering Education. This brought the membership of EJC to eight national societies having a total membership in excess of 170,000, not counting student members.

Three of the societies invited to join EJC, American Association of Engineers, American Society of Heating and Ventilating Engineers, and the Institute of the Aeronautical Sciences, took no action and the invitations extended to them expired on Dec. 31, 1953. However, the way was left open for these societies to apply for membership at a later date, should they desire to do so.

Objectives of EJC

1 To advance the general welfare of mankind through the available resources and the creative ability of the engineering profession.

2 To promote co-operation among the various branches of the engineering profession.

3 To advance the science and the profession of engineering.

4 To develop sound public policies respecting national and international affairs wherein the engineering profession can be helpful through the services of the members of the engineering profession.

Two of the eight societies rejected the invitation to join EJC. In its letter of rejection, the Institute of Radio Engineers requested continued co-operative activity with EJC on specific problems of mutual interest. Their rejection was dictated by two basic policies of long standing: (1) that IRE shall not engage directly or indirectly in legislative activity; and (2) that IRE as a society is not entitled to represent its members as individual members of the engineering profession, or as a body, on social or general professional matters, and shall not, as a society, take a stand even on technical matters.

After considerable study and additional meetings between a special joint committee consisting of three members of EJC and three representatives of the National Society of Professional Engineers, the latter organization declined to accept the invitation to join EJC. In the resolution adopted by the Board of Directors of NSPE on Nov. 7, 1953, the invitation was declined "at this time, in accordance with the firm conviction of this Board that no organization can adequately represent the engineers of this nation, unless that organization is based primarily on individual membership and constituted to assure prompt and effective means of communication between the individuals, their local or state units, and their national governing body." The resolution goes on to express the firm desire of NSPE to continue mutual efforts toward the most effective action possible between our two organizations.

While NSPE did not accept the invitation, the study resulting from the joint committee did much to further a mutual understanding between the two organizations. In addition, it has provided a valuable document for the guidance of EJC. The Joint Committee on Relations between EJC and NSPE is being continued by both organizations to further explore areas of mutual co-operation between them.

Public-Service Activities

EJC's activities and the work of its committees fall into the broad categories of national-welfare or public-service activities and professional activities.

In the first category is its Committee on Engineering Sciences which co-operates with the National Science Foundation in initiating and developing basic research in the engineering sciences. That Committee also assists members representing engineering on the National Science Foundation Board. It has a task committee working actively with the National Science Foundation on the development of the engineering section of the National Scientific Register.

The EJC Committee on International Relations (CIR) acts as a co-ordinating agency between the engineering profession in the United States and abroad. The Committee has been working actively with the Pan-American Federation of Engineering Societies (known as UPADI from the Spanish title Union Panamericana de Asociaciones de Ingenieros). EJC is the United States member of UPADI. CIR was instrumental in helping to rebuild the engineering libraries of war-torn countries by acting as a clearinghouse for contributions of books that were delivered through the medium of the United States Book Exchange.

Also in this first category are the contributions of Engineers Joint Council to the development of a sound national water policy as reflected in their report "Principles of a Sound National Water Policy"; the contributions of EJC through its National Engineers Committee on the Industrial Disarmament of Japan; and the statement of EJC's Atomic Energy Panel to the Joint Congressional Committee on Atomic Energy recommending changes in the Atomic Energy Act to permit the engineering profession to make its maximum contribution in the development of atomic energy for peaceful purposes.

In addition to its work on the industrial disarmament of Japan, EJC's National Engineers Committee has continued to function in an advisory capacity to government agencies such as the Federal Civil Defense Administration, and to the President in connection with the establishment of the St. Lawrence River Joint Board of Engineers.

EJC also has an Advisory Committee to the Lewis Historical Publications, the official publishers of "Who's Who in Engineering." There is representation, not only from the eight constituent societies of EJC, but also from the Institute of the Aeronautical Sciences, The Engineering Institute of Canada, Institute of Radio Engineers, Society of Automotive Engineers, and National Society of Professional Engineers.

Professional-Development Activities

In the area of professional development, EJC is continuing, through its Special Surveys Committee, its surveys of supply, demand, and professional income. NSPE is represented on that committee too. A study of Professional Income of Engineers in 1953, covering the incomes of nearly 70,000 engineers employed in industry, education, and government, has been released recently.

The Engineering Manpower Commission of EJC has been working actively for the past three years to secure the most effective use of engineers in the national health, safety, and interest. In this area it has done much to stimulate the interest of qualified high-school graduates in careers in engineering. It has also done much to promote more effective utilization of engineers, not only by the government, but also by industry. The activities of the Commission actually lie in both areas—professional and national welfare.

Of major significance in the professional area, however, is the work of two committees. First, the Committee on Employment Conditions through the constituent societies has been making a study of employment conditions for engineers. While its work is not yet complete, that committee is hard at work studying the interests of engineers in collective bargaining, in professionalism, and in other activities that affect their employment conditions.

Second, is the Committee on Recognition of Specialties in Engineering. As a result of a suggestion that came to EIC through the Joint Committee on the Advancement of Sanitary Engineering, a committee was formed to consider the problem of recognition of specialties in engineering. This need was emphasized by the difficulties encountered by sanitary engineers in being recognized as competent within their specialty, especially by persons outside of the engineering profession. Sanitary engineers work very closely with members of the Public Health Service, and with the medical profession.

After the EJC Committee on Recognition of Specialties was established, the problem was discussed with the Joint Committee on the Advancement of Sanitary Engineering. The EJC Committee is watching with a great deal of interest the work being done by the Joint Committee in developing plans and procedures for recognition of sanitary engineering as a specialty.

Current thinking is along the lines of specialty boards to examine engineers desiring to be recognized as accomplished in a specialty in a somewhat similar manner to that employed in the medical profession. When the plans and procedures have been worked out in full detail and have been tested in the pilot study on sanitary engineering, they will unquestionably be extended to other fields cutting across the interests of more than one of our constituent societies. Hydraulic and nuclear engineering are two examples.

Other EJC Activities

EIC is in the process of change and it is entirely different now from what it was two years ago.

For example, two important activities are under way. One of the recommendations of the Exploratory Group had to do with the affiliation of state, regional, and local societies with EIC. A special committee is now actively working on that problem. An announcement is expected to be made in that area shortly. That same committee is also studying the affiliation of national societies that meet all the requirements for EJC membership except that of size.

The second activity of interest is that of individual participation in EJC. This is deemed to be of such importance that the Executive Committee itself is devoting additional time to the problem. Engineers close to EJC believe that real progress will also be made here.

In order to develop a channel of communications between individual engineers and EJC, a bimonthly bulletin is being planned. This bulletin will be distributed to local, regional, and state engineering societies and councils. It will be quoted in the journals of the national societies. Through this medium, it is hoped the individual members of the profession will learn what EJC is doing and how it is developing.

Conclusions

If, in its activities, EJC gains the support of the individual members of the engineering profession, it can become the unity organization for engineers. To be successful, however, it must have the interest and support of the individual engineer.

Engineers who desire a collective-bargaining agency as a unity organization, however, will have to look elsewhere. EJC cannot and will not become a collective-bargaining agency, nor will the existing technical societies.

Those who point to the strength of unity organizations in the medical and legal professions should realize that both of those professions are predominantly self-employed. There is no collective-bargaining problem there. To attain recognition and true professional status, especially in the eyes of the public, engineers need to encourage initiative, resourcefulness, creativity, and individual incentive among the members of their profession. These will be the tools which can develop engineers professionally, improve the practice of engineering, and provide effective professional services to the national welfare, or in the public interest. These factors are the direct opposite of collective bargaining.

We, as professional people, have an obligation to devote a share of our time, efforts, and funds as a service to the nation in matters affecting the national welfare or in the public interest. If we do not carry on such activities, we will not maintain a professional status.

Activities of the type carried on by EJC develop out of the need for them. It is of tremendous significance that, only a year after AEC ceased its operations, it became necessary to form another organization—EJC—to fill this need, or concede that the engineering profession as a whole was voiceless in matters of national concern. Since 1917, engineers have had, except for one year, an organization actively engaged in such operations.

I believe a successful and continuing unity or solidarity organization to serve the engineering profession can be built upon the framework already established in EJC and the developments it is undergoing, if we will lend it our constructive support. Unless we build EJC into the spokesman for our profession in these areas of activity, we will find ourselves represented by other, less qualified, organizations hardly distinguishable from labor unions. What we, as individuals, get from EJC, or from any other organization for that matter, will be in direct proportion to what we, as individuals, put into it.

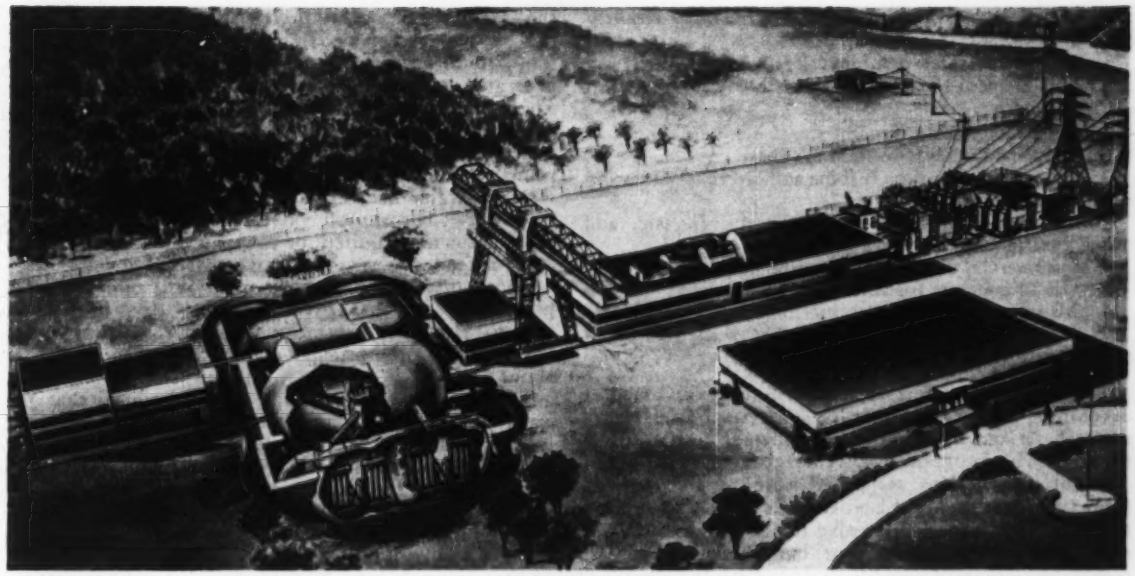


Fig. 1 Preliminary artist's sketch of first central-station atomic plant. The plant components depicted are, from the left: a building for fuel handling, the atomic reactor and heat exchangers, the maintenance building and overhead traveling crane, the turbogenerator building, the switchyard containing transformers and circuit breakers, and transmission lines. In the right foreground is a building containing shop and administrative facilities. This pioneer nuclear-power plant will produce a minimum of 60,000 kw of electricity and will use central-station steam and electric-generating equipment.

First Central-Station Atomic-Power Plant . . .

. . . to be a pressurized light-water-cooled and moderated, slightly enriched uranium-type reactor and will generate at least 60,000 kw of useful electric energy

On April 12, 1954, the Atomic Energy Commission announced that the nation's first full-scale central-station atomic-power plant, Fig. 1, will be built near the village of Shippingport, Pa., on the south bank of the Ohio River about 25 airline miles from Pittsburgh.

The Westinghouse Electric Corporation, as of July, 1953, was assigned responsibility for the development and design of a pressurized light-water reactor (PWR) and primary coolant circuit intended as the heat source for generating the electric power. Westinghouse was also assigned responsibility for the manufacture, fabrication, assembly, and testing of the pressurized water reactor.

In October, 1953, the Atomic Energy Commission also selected Westinghouse as the contractor for the engineering and construction of the steam plant, the electrical generating plant, and site facilities; for the procurement and installation of associated components; and for operation of the entire plant complex, including the reactor. At this same time, industry was invited to propose ways and means whereby it might participate in the project and help defray the cost.

Following the receipt and analysis of nine proposals, the Commission, in March, 1954, announced that an offer made by the Duquesne Light Company of Pittsburgh, Pa., was most favorable to the Government and would be accepted. The offer stipulated that Duquesne would furnish a site for the entire PWR project, that Duquesne would build an electric-generating plant, that it would contribute $5 million toward the cost of the reactor plant, and that it would operate the over-all plant at no cost to the Government. In addition, Duquesne will purchase steam produced by the reactor plant at certain specified rates which vary from 48.3 cents per million Btu the first year to 60.3 cents per million Btu the fifth year.

General Specifications of Atom Plant

When Westinghouse commenced work on the primary plant, the company was given the following general specifications:

1 Generation of at least 60,000 kw of useful electric energy.

Based on a paper presented by Charles H. Weaver, Manager, Westinghouse Atomic Power Division, Pittsburgh, Pa., before the Atomic Industrial Forum, Washington, D. C., May 24, 1954.

2 Use of light-water-cooled and moderated slightly enriched uranium-type reactor.

3 600 psi saturated or higher steam conditions.

4 Fuel-element life as long as possible between chemical reprocessing.

5 Refueling with minimum shutdown period.

6 Simplified reactor-control system.

7 Central-station-type turbine and electric-generating equipment.

8 Conventional central-station steam, electric, and other auxiliary systems.

9 Commercial standards of equipment.

10 Use of concrete for shielding.

11 Minimum possible construction cost of the plant.

12 Minimum possible operating cost of the plant consistent with the foregoing requirements.

The bulk of the effort on reactor design was aimed at developing information necessary to choose a fuel-element shape and to establish the thermal design of the reactor. This program involved preparing a number of different core designs associated with various fuel-element types. It involved heat-transfer studies to develop the basic data required to prove the design and use was made of a special fuel-element burnout test loop. A survey and study of various reactor-control techniques were also conducted.

In addition, preliminary design of the primary coolant system was started, looking toward determination of the number and size of primary loops, the methods to be used in constructing components, and preparation of specifications for long-delivery items. Work also began on site design, plant layout, the plant electrical systems, and plant control.

The basic design of the PWR plant is now, and for some time has been established, in keeping with the general specifications which the Commission laid down.

Main Coolant System

The main coolant system, which serves both to absorb heat generated by the reactor and to deliver heat to the steam generators, will consist of four loops operating off the reactor vessel, as shown in Fig. 2. Each loop, in turn, consists generally of a pump, a steam generator, shutoff valves, and interconnecting pipe. The pumps continuously circulate coolant water between the reactor and the steam generator. The steam generator, for its part, is the connecting link between the primary system and the steam system. It consists of a water-to-water heat exchanger, and a steam drum and separator. The shutoff valves permit isolation of one loop if it is not required, or to repair one loop while the other three loops are operating.

The water in the primary plant will circulate at a pressure of some 2000 psi to prevent boiling in the core and to eliminate cavitation problems. The average temperature of the primary-plant water is maintained at about 525 F.

The primary coolant loops are so designed that the rated plant output is produced with three of the four loops operating. The fourth loop can be operated if desired, but normally will serve as a spare. The loops divide the load equally, and the steam generated by each is fed to a steam header and delivered to the turbine. To produce 60,000 kw net with three loops operating, the pump in each loop circulates water at a rate of about 16,000 gpm. This makes a total of about 48,000 gpm through the reactor. About 1000 hydraulic horsepower is required to circulate the water in each of the three loops. All surfaces of the primary plant which come in contact with high-temperature primary coolant water probably will be made of stainless steel. All components will also be designed to prevent leakage of the primary coolant water from the primary system.

In addition to the main coolant system, the primary plant involves a number of auxiliary systems. These accomplish such necessary functions as maintaining the primary system pressure at 2000 psi, filling and draining the primary system, purifying the water, providing for control of the reactor, dissipating the decay heat of the reactor after shutdown, etc. Preliminary designs of many of these systems have been prepared.

The primary water is maintained at 2000 psi by a pres-

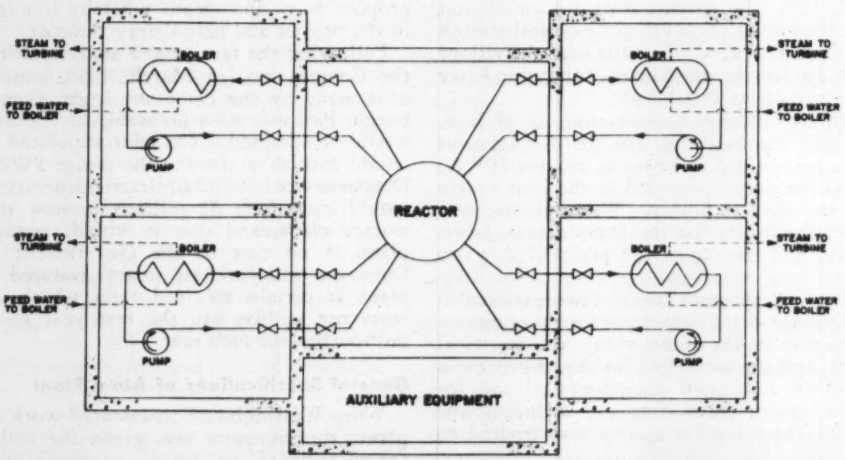


Fig. 2 The main coolant system of the PWR plant, which serves both to absorb heat generated by the reactor and to deliver heat to the steam generators, will consist of four loops operating off the reactor vessel. A loop consists of a pump, boiler, shutoff valves, pipe.

surizing tank which floats on the system and is connected to one of the reactor outlet pipes. This tank is normally filled with about equal volumes of water and saturated steam at more than 600 F. The head of steam is maintained by electrical heaters in the water. Load changes are accompanied by some volume change of the primary water. The head of steam expands or contracts to accommodate this water volume change.

Reactor Core

The most interesting and highly developmental part of the plant is, of course, the reactor core. It will consist of a geometrical pattern of closely spaced fuel elements. The heat-generating material will be slightly enriched uranium, that is, uranium containing a slightly higher amount of the 235 isotope than natural uranium as mined from the earth. More than 10 tons of uranium will be used in the first core. The fuel elements will be protected by a corrosion-resistant material designed to prevent the coolant water from becoming contaminated with particles of uranium and fission products.

These fuel elements will be formed into a right circular cylinder about 6 ft in diam and 7.5 ft high. The maximum fuel-element surface temperature will be less than 636 F, the boiling point of water at 2000 psi. The maximum heat flux will be over 350,000 Btu per sq ft per hr, and the average power density will be about 45 kw of heat per liter.

The reactor container, as well as the entire plant, is being so designed that fuel elements of various shapes and materials of various types can be used in cores following after the first core. Such flexibility will add somewhat to PWR costs, but this feature is appropriate to a developmental plant and it may help importantly in advancing atomic-power technology.

Reactor Vessel

The reactor vessel, which contains the core, will be built large enough to accommodate cores physically bigger than the first one. Here is another aspect of the flexibility feature just mentioned. The vessel shell will be about 9 ft ID and have an over-all height of over 25 ft. This shell will consist of carbon steel clad with stainless steel. The cylindrical wall of the vessel will be penetrated by the four inlet and four pipe outlet connections for the four main coolant loops. A contract for the design and manufacture of this vessel is being negotiated.

Steam Generators

The steam generators will consist of two major components: first, the heat-exchanger portion and second, the steam drum. The heat exchanger will consist of a bundle of stainless-steel tubes, the ends of which are welded into heavy tube sheets. The entire assembly will be enclosed in a steel shell. Primary coolant will flow through the inside of the tubes. The steam-plant feedwater will be fed into the shell side of the heat exchanger and will be converted to steam as it flows upward over the outer surface of the tubes. The steam thus generated will rise to the steam drum where it will be dried by passing through a conventional steam separator. The steam will leave the steam drum at 600 psia saturated. The Foster Wheeler Corporation will build two and The Babcock & Wilcox Company will build two. It is felt that the relatively small additional cost of splitting this order is more than justified on the basis of additional knowledge to be gained, since the two companies are using designs which differ significantly.

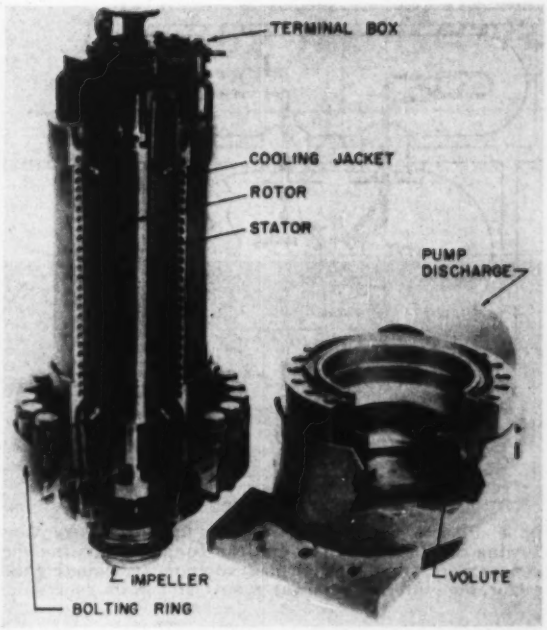


Fig. 3 Canned motor pump to be used in nuclear-power plant is absolutely leakproof. Maintenance is also eliminated. Cutaway shows the motor unit and volute casing.

Canned Motor-Driven Pumps

The pumps will be single-stage centrifugal units driven by induction motors of the canned type, Fig. 3. Use of canned motors permits elimination of the maintenance and leakage problems likely to be encountered if rotating seals were employed. (According to an Atomic Energy Commission report, this motor which circulates hot water or liquid metal for a reactor is literally "canned." A squirrel-cage rotor is contained in a shrink-fit jacket of inconel and turns within a stator that is likewise enclosed in inconel. The space between is filled with the fluid that is being pumped through the reactor circuit. The bearings, inside the stator, are lubricated by the fluid passing through.) The Westinghouse Equipment Department is now designing a prototype pump and motor which will be built and tested before manufacture of the final units. The PWR pumps will involve an output of about 1000 hydraulic horsepower and an input of about 1200 kw.

Valves and Pipe

The primary-coolant stop valves will be of the gate type. At least some of these valves will be designed to permit remote operation. They will be hermetically sealed and will function hydraulically. A prototype main coolant valve is now on order from the Crane Company.

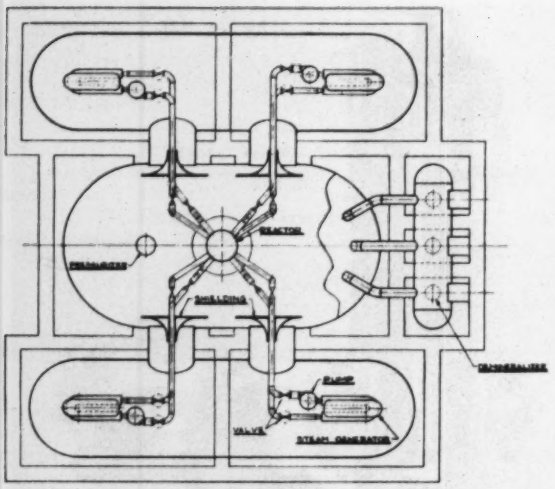


Fig. 4 Plan view of a proposed layout for the primary plant showing the concrete shielding, the container housing the primary plant, and the major plant components including the reactor, the pipe, main coolant pumps, and steam generators

The primary-coolant-system pipe will be approximately 18 in. OD. It will be fabricated from stainless steel. It seems probable that the pipe and necessary elbows will be manufactured by rolling and welding stainless-steel plate.

Nuclear Control of the Plant

Regarding the nuclear control of this plant, it is intended to take advantage of the inherent stability of pressurized water reactors as the basis for control during power changes. Because of the negative temperature coefficient which can be designed into such a reactor, the core will automatically maintain the temperature of water flowing through it at a constant value. Thus, if heat is removed from the primary coolant and if the coolant-water temperature therefore decreases, the reactor automatically restores this heat by increasing its power output until the water temperature regains the original value. The reverse is true when the rate at which heat is being removed from the primary water is decreased. The reactor itself accomplishes this control automatically without the operation of any equipment.

The entire primary plant, Fig. 4, will be enclosed in a steel container to retain any radioactive materials which might escape from the plant as a result of an accident. Although such accidents are extremely improbable, safety requirements are such that, at least on this first plant, great precautions must be taken.

Conclusion

No one has ever built a power reactor like this before. The slight enrichment, the long core life span, the deliberate intent to burn plutonium after it is generated through reactor operation, the use of ordinary water in conjunction with the other features, and additional matters which cannot be disclosed—each of these objectives, considered separately, is without precedent, at least in the free world.

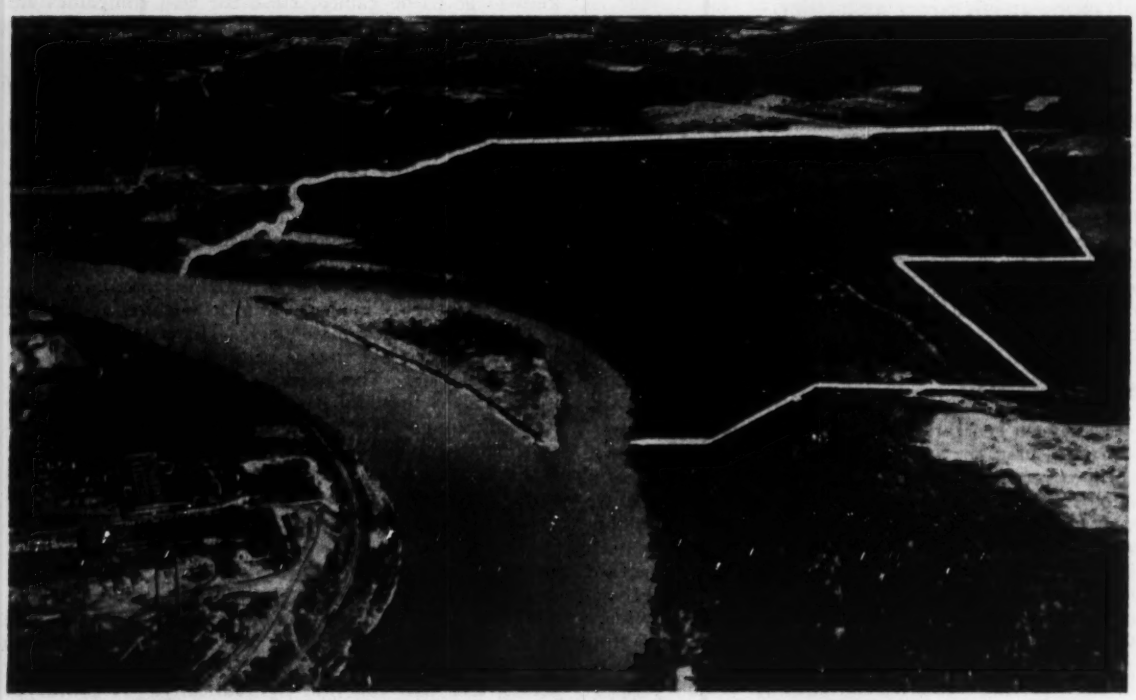


Fig. 5 Aerial view of site near Shippingport, Pa., where the nation's first full-scale central-station atomic-power plant will be located. The 60,000-kw nuclear station will employ conventional central-station steam, electric, and other auxiliary systems.

Briefing the Record

Abstracts and Comments Based on Current Periodicals and Events

J. J. Jaklitsch, Jr., Associate Editor

Fig. 1 Over-all view of world's largest extrusion press. This 14,000-ton unit has just begun full production at the Lafayette (Ind.) Works of Aluminum Company of America. It is the first of the giant presses ordered under the U. S. Air Force Heavy Press Program to begin production. The press will make components for supersonic planes and guided missiles.

14,000-Ton Extrusion Press

THE start of operation of the 14,000-ton extrusion press at Aluminum Company of America's Lafayette (Ind.) Works signals the productive beginning of the multi-million dollar U. S. Air Force Heavy Press Program. Giant extruded aluminum shapes from this unit are the first of the light, strong, low-cost aircraft parts to come from the big extrusion and forging presses leased to industry under this Program.

These presses will produce vital aircraft components that will help aircraft manufacturers keep pace with the structural demands of supersonic planes and guided missiles. Parts produced by these presses will substitute for aircraft sections that formerly had to be assembled from many small components. The products of the big presses not only will afford large savings in cost, but also will contribute to a revolution in aircraft design.

Two and one-half times as powerful as existing extrusion presses in this country, the 14,000-ton unit at Lafayette will form four times the weight of aluminum previously possible in one "squeeze." Producing the same extrusion, the new giant will extrude two to four times as many pounds per hour as the largest previously existing press.

The press at Alcoa's plant has a long history. It was originally intended for Hitler's war machine and was being constructed by Schloemann, A. G., Dusseldorf, Germany. At the end of World War II it was practically completed. The United States Government placed an order with Schloemann for the work to be finished and the press was purchased for shipment to this country.

Under the direction of Alcoa engineers, the press was redesigned to meet American production standards and its capacity enlarged from 13,200 to 14,000 tons. A sister press of 13,200 tons had already been taken behind the iron curtain by Russia.

The installation of the press highlights the fiftieth anniversary of Alcoa's production of extrusions. Alcoa's first extrusion press rated at 1000 tons pressure was installed at the Massena (N. Y.) Works in 1904.

3,000,000-Lb Stretcher

The auxiliary equipment for the 14,000-ton press is a massive 180-ft-long stretcher which will straighten extrusions as long as 110 ft.

The big stretcher was designed and installed by Alcoa as part of its $4,000,000 contribution to the new installation. As the world's largest machine for stretching extrusions, this unit has four times the force of any of its predecessors. It can straighten tough, 75S aluminum-alloy shapes up to 60 sq in. in cross-sectional area.

The press and the stretcher will team up to produce aircraft structural parts for such giant planes as the Boeing B-52 jet bomber. At the same time, they open up new horizons for aluminum extrusions in civilian markets. Large extruded shapes will someday be available for railroad car, bus, ship, truck, and trailer construction. In addition, pipe up to 20 in. in diam can be extruded on the press for big pipe lines.

Extrusions weighing as much as 2500 lb and measuring as long as 110 ft per piece can now be offered by Alcoa. The size that can be produced in that length has increased

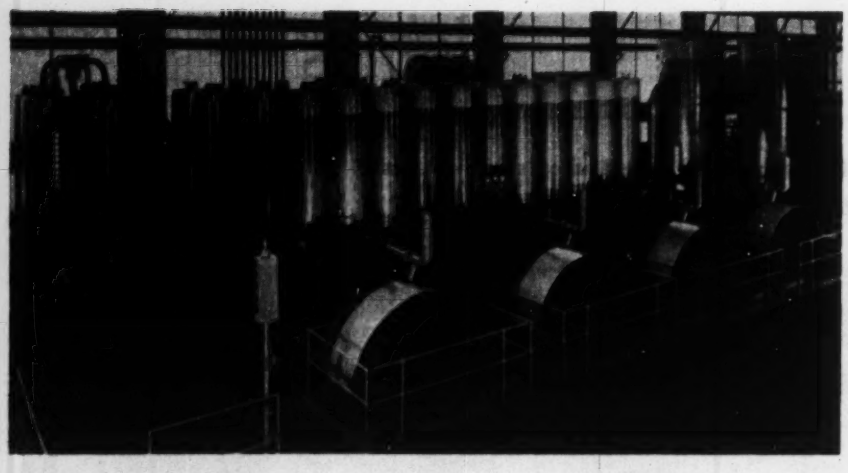


Fig. 2 Hydraulic system for the 14,000-ton extrusion press at Alcoa's Lafayette (Ind.) Works. The four bottles on the extreme left are the water bottles; and two water-storage tanks are shown at the extreme right. All the remaining cylinders are air bottles.

with the operation of the 14,000-ton press from 5.4 lb per ft to 22.7 lb per ft, or from 4.5 sq in. in cross-sectional area to 19 sq in. The practical maximum circumscribing circle diameter for shapes has increased from the present 13 in. to 23 in. Because of the high unit pressures that the big press can exert on strong aluminum alloys, Alcoa can offer extruded shapes that are not only larger and longer but also thinner than previously possible. This results in a highly desirable combination of lightweight and high strength.

Production Operations

The production cycle on the Schloemann press begins with the heating of ingots in a battery of 60-cycle induction heaters, located adjacent to the press. The ingots, which vary from 15 to 29 in. in diam, and up to approximately 70 in. in length, are heated to temperature at a rate sufficient to keep pace with the maximum production of the press.

Taken from the induction-heating units, the ingots are fed automatically into the big press which squeezes them into shapes through its dies onto a long runout table attached to the extrusion die holder. When the ingot has been extruded, the runout table and die are moved forward hydraulically so that the butt end of the ingot can be cut off by the shear.

Two heat-treatments, solution and precipitation-treating, are normally used to improve the strength of extrusions produced on the press. Solution-treating is performed after the extruded shapes leave the press, in a 120-ft-long horizontal furnace. After heating in the furnace, extrusions are quenched by continuous travel on a roller conveyer through a spray chamber. Solution heat-treating is done also in vertical electric furnaces that are built directly over a long vertical quenching tank.

The next production step is performed on the 3,000,000-lb stretcher. This big unit "pulls" the extruded shape to remove distortion and relax internal stresses built up during production operations.

After stretching, the extrusions are cut to required length by a 96-in. saw.

A 120-ft gas-fired, batch-type aging oven is used for the final precipitation heat-treatment of long lengths produced from the 14,000-ton press. Additional equipment, such as roll-contouring machines and untwisting machines, are available for supplementary operations to complete the product.

Fig. 3 The 3,000,000-lb stretcher shown is used to pull extrusions produced on the world's largest extrusion press at Alcoa's Lafayette (Ind.) Works. The 180-ft-long giant stretcher has a pull of 38 diesel locomotives and will straighten 110-ft-long extrusions.

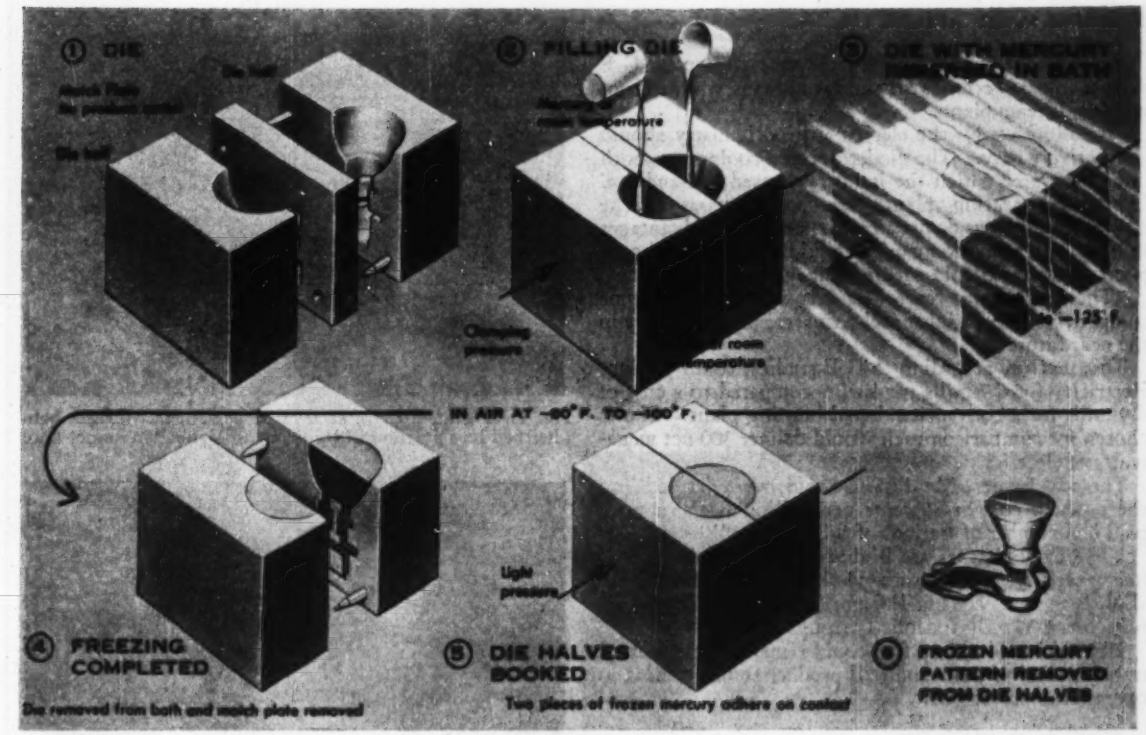

① DIE
② FILLING DIE
③ DIE WITH MERCURY
IN AIR AT -60° F. TO -100° F.
④ FREEZING COMPLETED
⑤ DIE HALVES BOOKED
⑥ FROZEN MERCURY PATTERN REMOVED FROM DIE HALVES
Light pressure
Two pieces of frozen mercury adhere on contact

Fig. 4 Sequence of Mercasting operations shows parts of metal die, pouring of mercury, freezing, and booking to form one integral frozen-mercury pattern. The method permits larger and more complex shapes to be cast in a variety of metals.

Frozen-Mercury Precision Casting

FROZEN-MERCURY precision casting of large, complex parts using a new casting technique was reported by Dr. I. R. Kramer, vice-president of Mercast Corporation. Speaking before the 58th Annual Meeting of the American Foundryman's Society in Cleveland, Ohio, Dr. Kramer described how precision casting is now possible to a degree never before achieved by conventional methods, permitting larger and more complex parts to be cast in a wide variety of metals, and with better surface finish.

In describing the process, Dr. Kramer pointed out that the key to the process lies in the ability of frozen-mercury to be "booked" or adhere to itself on contact with slight pressure. Basically, the process involves pouring mercury into the die, which is made in two or more sections; and the whole unit is submerged in a dry ice-acetone bath at temperatures around —100 F which freezes the mercury. The frozen mercury assembly is removed from the bath, booked to produce a single frozen-mercury pattern, which is extracted from the die and dipped into a series of slurries to form a ceramic shell around it. Coming to room temperature, the mercury melts and is run out for subsequent re-use. The thin shell mold is then fired to strengthen it and the metal is poured.

According to Dr. Kramer, advantages of this ceramic mold include excellent surface finish, closer tolerances in the metal casting, thin-wall castings, and the fact that the mold does not react with molten materials. This factor plays a major role in successful casting of highly reactive metals.

At present the Mercast process is being used industrially to produce such parts as wave guides and other radar components, turbine blades and other jet-engine components, as well as piston-engine parts. Numerous other products stemming from the frozen-mercury method include pneumatic piston components, electric-generator brackets, motor brackets, bearing supports, nozzles, impellers, pump vanes, and glass mold dies. Indicating the size of units that can be produced, Dr. Kramer told of steel castings having a 42-in. diameter and weighing 300 lb made by the Mercast process; even larger castings are contemplated.

Private Atomic-Power Plants

WITHIN five to ten years, privately financed atomic-power plants will compete successfully with conventional power plants, it was predicted by Francis K. McCune, general manager of the General Electric Products Division. He spoke on the Atomic Industrial Forum held in Washington, D. C., recently.

Reactors best suited for "earliest and most effective competition with conventional fuel plants" were described by Mr. McCune as:

1 A light-water-moderated and cooled boiling reactor.

2 A graphite-moderated, water-cooled reactor.

The first type, he said, would eliminate the need for a boiler system, since water would be boiled inside the reactor to produce radioactive steam which would power a turbine.

Boiling Reactor

He said that the boiling reactor was chosen by G-E experts in part because it is similar in many ways to conventional steam plants.

"Its adoption by the electric-utility industry should be relatively easy. The moderator and coolant are both ordinary water which the industry is used to handling. Chemical-separation plants are not necessary. The boiling reactor has demonstrated safeguards' advantages so that operating companies should be able to choose plant sites as available within their systems.

"The light-water reactor is one which can become competitive in the higher fuel-cost areas of the country in the near future."

This reactor, according to G-E studies, could produce electricity for 6.7 mills per kwhr, compared to a cost of 6.9 mills for a conventional coal-burning plant. Plants chosen for comparison each would deliver 300 net megawatts of electricity.

The cost figures, Mr. McCune said, were derived "on the basis of coal at 35 cents per million Btu's, a price paid in a number of sections of this country."

"The fixed charges are higher on the atomic plant," he reported. "It is estimated that operating costs are slightly more. The big difference is in the relatively low fuel cost, 1.35 mills for long-burn-up fuel."

He said long-burn-up fuel could remain in the reactor over a period of years and still produce sufficient heat to operate the power plant.

Graphite-Moderated Reactor

Mr. McCune described the graphite-moderated reactor as "a direct descendant of the graphite-moderated water-cooled reactors with which we have been producing plutonium at Hanford since 1946."

Cost of electricity from the graphite-moderated reactor, the G-E official said, would come to 6.8 mills per kwhr.

He said, however, that both types of reactor depend on development of an adequate long-burn-up fuel element which is not yet available.

Size of the graphite reactor chosen for cost estimate was described by Mr. McCune as quite large, with a net electrical capability of 700 megawatts, but he explained that the large size was designed to achieve economy of operation.

"The graphite reactor is not necessarily limited to such large sizes," he commented. "It is possible that it might be cooled by boiling water which would make it economic in smaller sizes."

Passenger Belt Conveyer

THE world's first passenger belt conveyer was placed in operation by the Hudson and Manhattan Railroad, in Jersey City, N. J., recently.

Designed by the Goodyear Tire and Rubber Company and the Stephens-Adamson Manufacturing Company, the "Speedwalk" has been installed in the H&M's Erie tube station to transport homeward-bound New Jersey commuters for a distance of 227 ft up an inclined ramp leading to the Erie railroad terminal. The moving rubber-belt passenger conveyer negotiates a 10 per cent grade for the first 137 ft.

Fig. 5 Workmen move section of passenger conveyer-belt-idler bed into position in Hudson and Manhattan tunnel floor

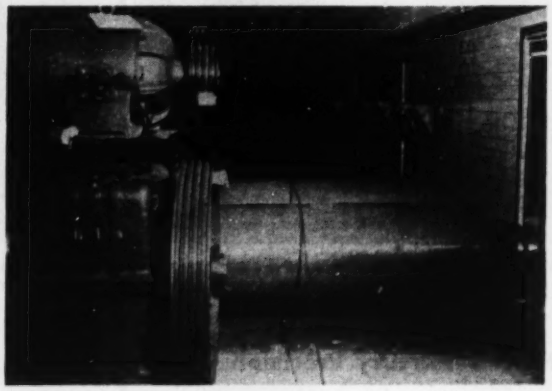


Fig. 6 The 460-ft belt has been threaded around head pulley. A 20-hp motor drives the endless rubber and fabric belt 120 fpm. Frames at the right await the handrail balustrade.

Fig. 7 Looking down 10 per cent grade of moving sidewalk, a workman readies rollers for the moving handrail return

Operating at a speed of 120 fpm, the belt will deliver passengers who walk along its moving surface to the end of the ramp in 35 sec, compared with a normal upgrade walking time of 55 sec through the regular passageway.

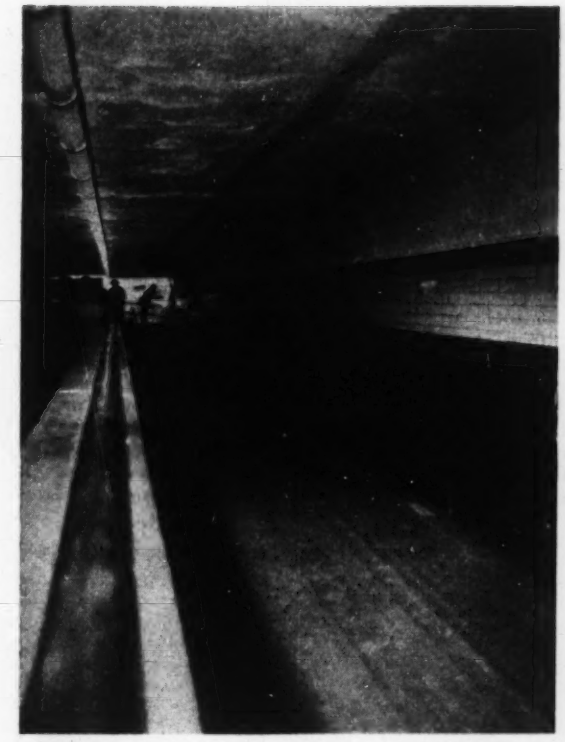


Fig. 8 Completed Speedwalk with moving handrails installed on both balustrades. A walkway, left, is alongside.

The belt conveyer, $5\frac{1}{2}$ ft wide and with moving handrails, utilizes only approximately half of the regular H&M ramp tunnel, leaving a walkway alongside. Hudson and Manhattan officials announced that the belt, which is reversible, will be operated only upgrade for the present between the hours of 7 a.m. to 7 p.m. A 20-hp electric motor drives the endless belt which rides along a bed of closely spaced steel rollers or idlers.

Hudson and Manhattan work crews spent a month installing the 30 tons of conveyer equipment and machinery which was fabricated at the Stephens-Adamson plant in Aurora, Ill., and the 11,000-lb rubber and fabric belt made by Goodyear in Akron, Ohio. The belt is $\frac{5}{8}$ in. thick and was manufactured as a single unit 460 ft long.

Goodyear engineers vulcanized the two ends together after the belt was threaded through the end pulleys and placed on the conveyer framework.

Plaster-Casting Process

THE plaster process, first developed on a large scale by Aluminum Company of America as a core material for the intricate bladed castings used in automotive torque converters, is now employed in a wide variety of aluminum foundry applications.

This plaster process, it is claimed, has extended the design possibilities for aluminum and magnesium castings to allow production of parts in the foundry that were formerly impossible to produce. Plaster joins sand and iron (permanent mold) as a basic material in Alcoa foundries.

The use of plaster of paris for casting aluminum is nearly as old as aluminum itself. But heretofore its use has been limited by various factors, including time and cost elements. The new permeable-plaster process reduces process time and cost and thereby is opening many new fields of application.

Permeable-plaster molds allow the casting of aluminum parts with thin cross sections and with excellent surface smoothness. In addition, accurate dimensional tolerances can be met with the process. The physical properties that can be achieved with permeable plaster are equal in most cases to those provided by aluminum sand castings.

Plaster mold components, already in extensive use for torque-converter parts, offer other promising applications

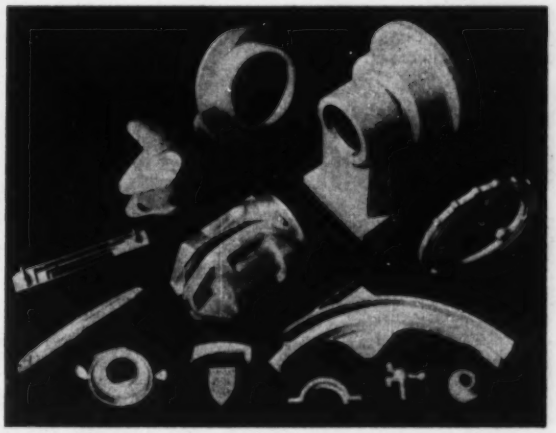


Fig. 9 Typical casting applications of the plaster process. Small castings, in foreground, are particularly attractive as cast with plaster. The size of these small parts can be judged by the Alcoa shield, bottom center, which is about 2 in. high.

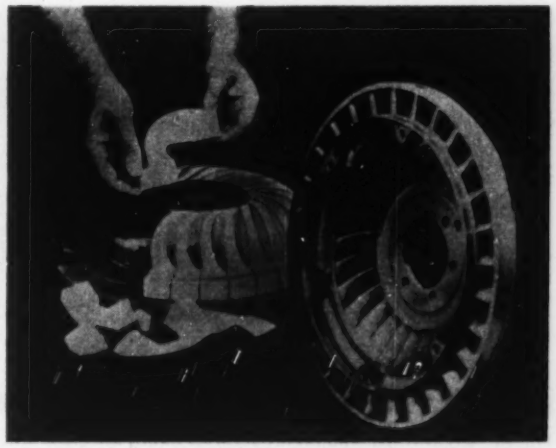


Fig. 10 The use of Alcoa's plaster-casting process in the production of intricate automotive torque-converter castings is demonstrated here. The plaster cores, at the left, are used to form the blades on the torque converter casting at right.

in the volume production of small castings, such as small bearings and building hardware parts. The process is not limited, however, to small parts.

Plaster mold components have been used profitably with sand or permanent mold materials to produce a composite mold casting. The plaster used in this combination allows the designer to specify surface and dimensional accuracy only where it is needed. The optimum use of the various mold materials will improve strength and often result in lower equipment and casting cost.

While the plaster process will not match fine machining tolerances, it is sufficiently accurate to avoid the machining that is often required with sand or permanent mold.

General tolerances possible with this new process are ±0.010 in. across the parting line for one inch or less.

Between points produced in one part of the mold ±0.005 in. tolerance is possible. A nominal surface finish of 125 rms or better can be achieved. Sharp corners can be cast where it is necessary.

Shell-Molding Foundry

A NEW mechanized foundry, built around and made possible by the shell-molding process, recently has been placed into operation by Walworth Company, Boston, Mass.

The foundry uses Bakelite Company resins and silicone lubricants developed by Linde Air Products Company, both Divisions of Union Carbide and Carbon Corporation. The silicone lubricants make practical the release of the shells from metal patterns.

A new automatic shell-molding machine, capable of producing 240 molds per hour, is the basic production element. Mold assembly, pouring and casting machinery, together with extensive conveyer systems, complete the mechanization. Walworth developed, designed, and markets this machinery which is being produced for foundry use by Link-Belt Company, Chicago, Ill. Converted from a green-sand bronze foundry to the modern shell-molding system, the mechanized Boston foundry is adapted to mass production of valves, threaded pipe fittings, pipe flanges, and other products

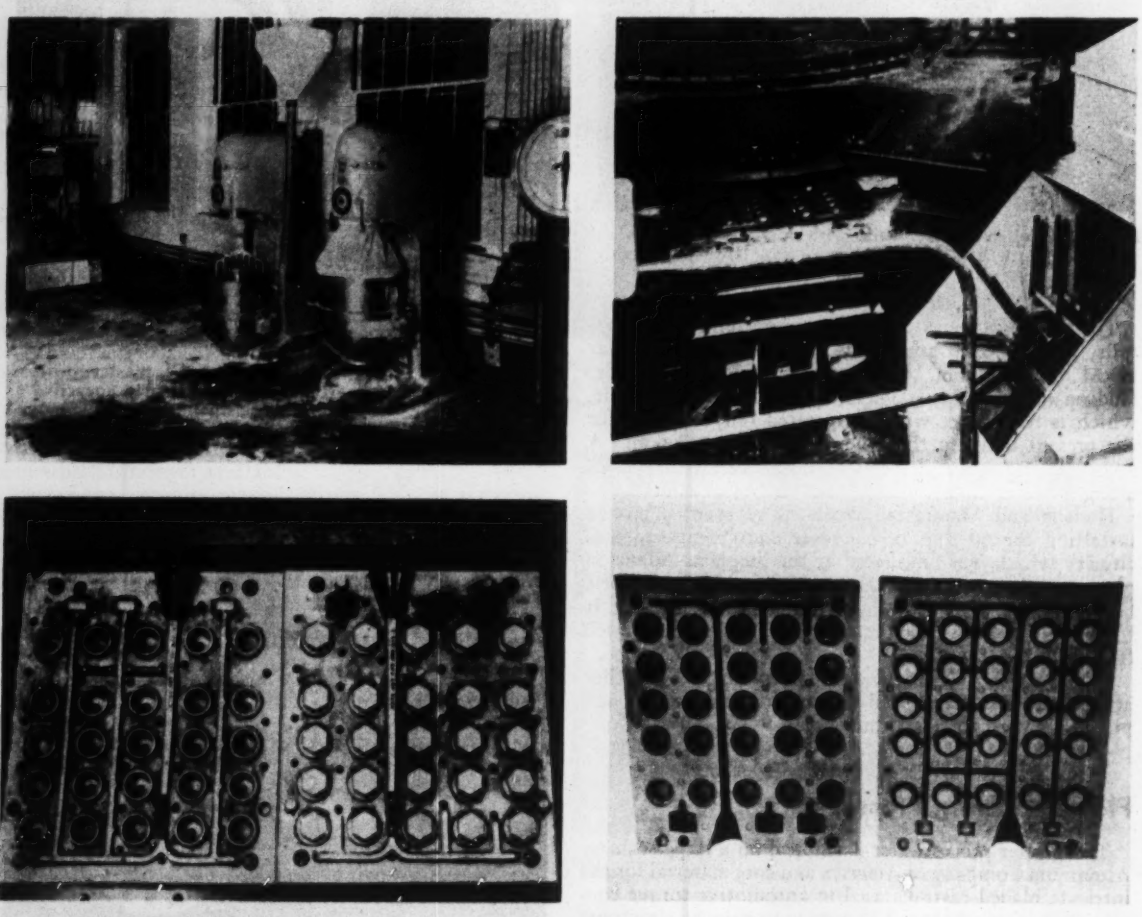


Fig. 11 Lightweight and highly accurate molds are made with sand bonded by Bakelite phenolic resins which are first blended with a wetting agent in large mixers (*top left*). The rotary mold-making machine automatically controls eight stations which can accomodate eight mold patterns at one time. Three stations preheat the pattern, three cure the mold, one station contains machinery for pouring the Bakelite phenolic resin-sand mixture on the pattern, and at the final station (*top right*) the completed shell mold is automatically ejected. Pattern plates measure 16 × 28 in. (*bottom left*) and can be used to form both halves of a 14 × 16 in. complete shell mold. Less rising and gating are required for mold; therefore less metal is used in casting (*bottom right*).

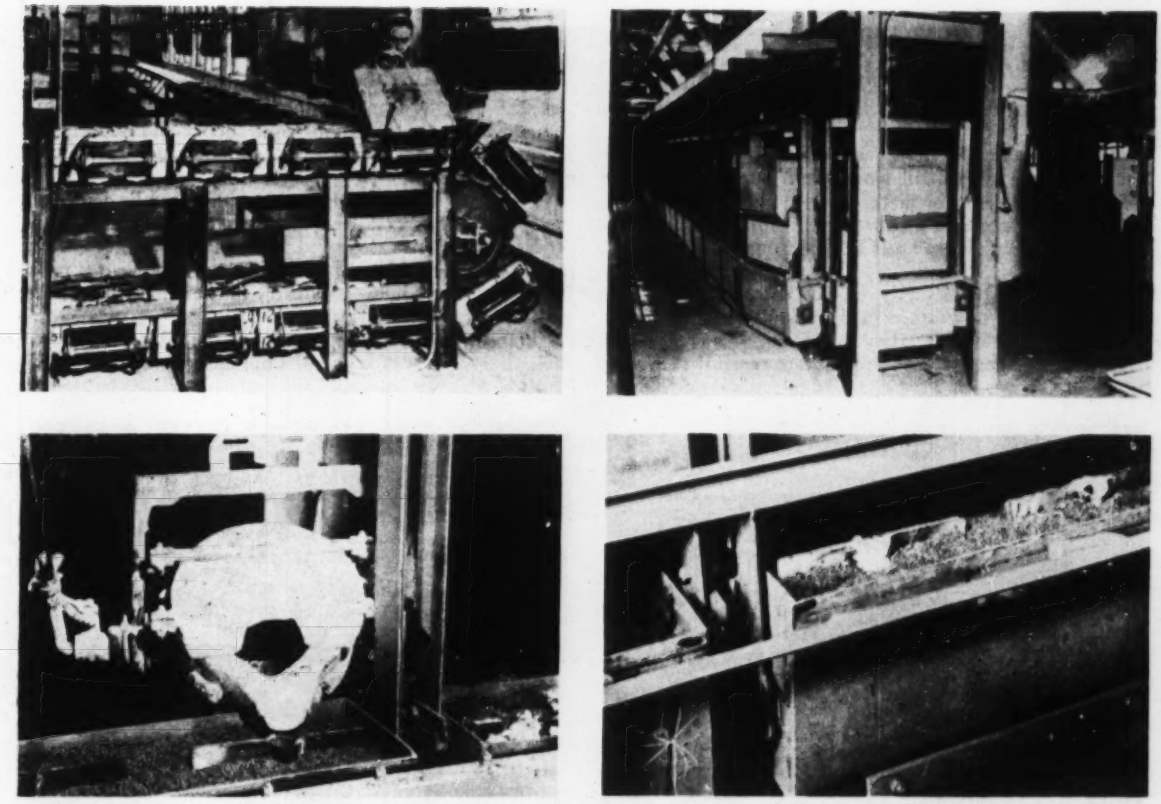


Fig. 12 Cured and ejected from the mold-making machine, two halves of a complete mold are placed in the mold-closing machine after cores are inserted. Adhesive is applied to the edges of one shell and the mating shell positioned over it. The closing machine automatically applies uniform pressure over the entire mold, insuring complete joining (*top left*). Completed molds can be sent by conveyer system to automatic storage racks or direct to the pouring machine. A continuous-belt pouring machine, where metal is poured into the mold to be cast, travels at about 6 fpm on a monorail conveyer (*top right*). The conveyer carries a series of steel boxes in which the assembled molds are placed. Steel shot is automatically poured around the mold to support it against internal pressure developed during the pouring. Molten metal to be poured into the mold (*bottom left*) is brought from melting furnaces in pouring ladles suspended from a monorail. Each 200-lb-capacity ladle can pour an average of 12 to 16 molds. After pouring, the steel box moves on to an automatic station where shot, casting, and mold are dumped from the box (*bottom right*). The shot is recycled for further use and casting and mold transferred automatically to a cooling conveyer. A shakeout conveyer separates most of the mold from the casting. The foundry was placed in operation by Walworth Co.

cast in bronze, brass, carbon steel, stainless steel, aluminum, and other alloys.

Clear-cut savings and other advantages over the former green-sand practice are said to be possible by the modern shell-molding system. Closer tolerances obtained with the accurate shell molds allow substantial savings in casting metal. Mold accuracy also reduces time, labor, and metal needed to machine down to tolerance. For the same reason, design allowances usually made because of inefficiencies in green-sand practice, are eliminated in the shell-mold process, yielding a greater number of pieces per mold.

Shell molds can be stored almost indefinitely without warping or losing their accuracy because of the dimensional stability of phenolic resins.

This provides a flexibility in foundry production almost unknown previously. Shell molds can be made faster than they are cast and stored on handy racks until needed. Green-sand foundry practice has to be continuous because the heavy molds cannot be stored.

A cleaner foundry and better working conditions also result from the shell-molding process. The large volumes of green sand and machinery needed to handle it are eliminated in shell molding. Fewer, and less highly skilled, workmen are needed to operate the automatic shell-molding machine. The new foundry system can turn out more castings in less floor space than green-sand production and do it under conditions more favorable to the maintenance of a steady labor supply.

Pump-Manufacturing Plant and Foundry

To HELP meet the nation's increased demand for water by better and more efficient pumping, Fairbanks, Morse and Company has built a new foundry and manufacturing plant at Kansas City, Kan. The new works was formally dedicated on May 19, 1954. It is geared to an annual output of enough pumps to move 35 billion gal of water or other fluids per day.

Besides the manufacturing plant that occupies 180,000 sq ft of the 38 1/2-acre site, the new pump works boasts a mechanized foundry that is said to be one of the most modern ever constructed. The foundry, with its tower-

ing cupolas, three-story core furnaces, large electric furnace, and a system of pipes that blows sand from one location to another as though it were a fluid, is able to turn out 82 tons of castings a day. The foundry occupies 147,600 sq ft.

Throughout both plant and foundry emphasis is placed on quality control from the time a metallurgist checks each pouring of metal with a pyrometer until a final check is made just short of the shipping room to see whether even such details as the paint work are satisfactory.

A modern lab containing one of the Midwest's four spectroscopes is maintained in the foundry to assure that the castings are of top quality.

Tools and gages used in the plant are carefully set after frequent inspections, because of the precise specifications which must be followed.

A "Dynetric Balancer" is provided to insure as near perfect balancing of pump impellers as is possible. This device works on the stroboscopic theory and quickly indicates an impeller that is out of balance and how it may be corrected.

The work of the manufacturing plant can be described as a fast, highly specialized, rather than a mass-production process. While it is geared for multiple production of pumps, the precision and variety required prevent it from being a mass-production industry in the same sense as the auto industry.

Though many custom pumps are built, the usual customer demands are for one of a number of sizes and varie-

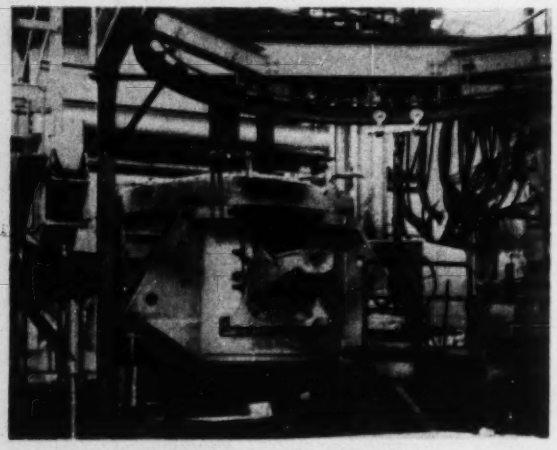


Fig. 13 This electric furnace located next to the cupolas in the new Fairbanks-Morse foundry will melt two tons of iron from a cold charge. It will hold at desired temperature as much as 11 tons melted in the cupolas. The furnace operates on only 96 volts a-c converted by a transformer, right, from 4160. However, wattage is 120,000. Kilowatts are figured at 600 to 800 per ton. The furnace can reach up to 3000 F.

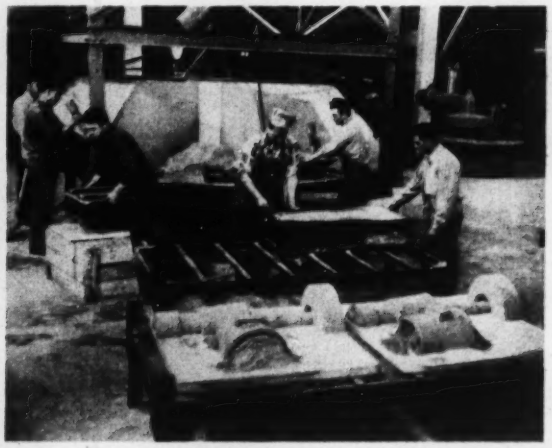


Fig. 14 Workers in the heavy core room of the foundry prepare cores for baking. The circular core table from which the men work gets the proper sand mixtures desired in each stall by a blower-pipe system. The worker calls the "sand center" on an intercom system and specifies the mix he wants. Then the worker swings the overhead hopper so that the spout is over his section of the table and gets his sand.

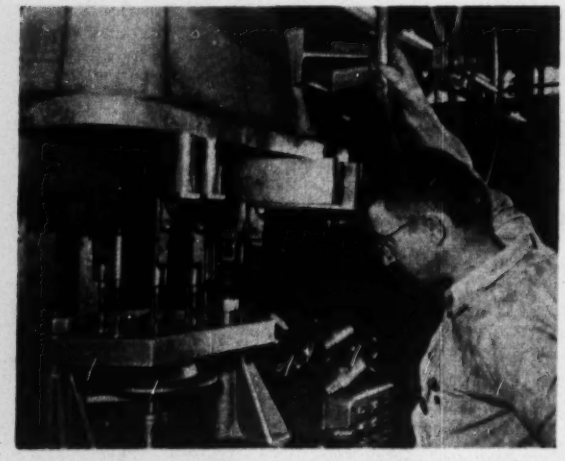


Fig. 15 Here a worker is shown drilling eight holes simultaneously in a pump adapter. This multiple-spindle drill, however, is capable of drilling 16 holes at one time.

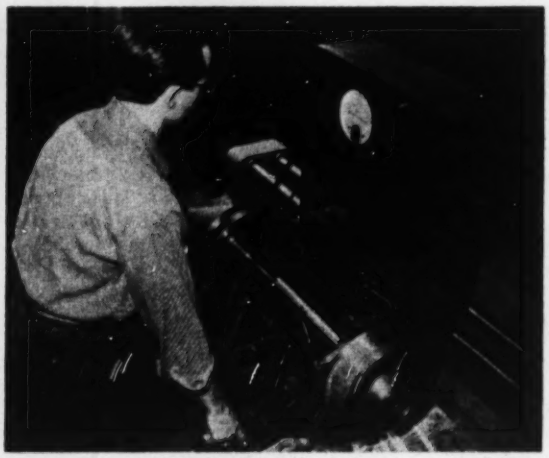


Fig. 16 Shown here is a dynetric balancer, an electronic device which uses stroboscopic tests to determine the balance of the all-important pump impeller and how to correct it.

Fig. 17 Large pump assembly line rounds a corner and stretches away toward testing floor. Workers assemble a large variety of pumps on this line.

ties which include "built-togethers," side suction, trash, angle flow, split case, and steam and power reciprocating pumps up to 16-in. capacity.

The plant also builds the "Z" type gas and gasoline engines from 2 to 30 hp, which drive pumps and perform numerous other functions in industry.

The manufacturing department is equipped with two overhead cranes, each with a 13-ton capacity, and three pendant, or floor-operated, three-ton cranes and numerous smaller lifts to speed production. Twelve gas-operated fork-lift trucks handle the palletized materials and products.

There are two test laboratories, located in the center of the manufacturing department, where all pumps are checked for performance before being shipped to customers. One of the laboratories is used for testing pumps up to 10-in. capacity, and the other, which will be used mainly for experimental work, can test pumps up to 16-in. capacity.

Hydraulics Forum

The activities during the dedication were highlighted by a forum on problems arising from the increased demand for water in the United States and related problems in the research and development of pumps and the general field of hydraulics. See "ASME News" in this issue for further details.

Low-Nickel Alloy

HIGHER operating temperatures, particularly in power plants, are pushing low-alloy materials now used in furnaces to their limits of usefulness. Construction engineers, therefore, are using alloys with higher nickel content, though the continuing shortage of nickel makes its conservation desirable. Research at Battelle Memorial Institute, Columbus, Ohio, for the Alloy Casting Institute, has shown that an alloy with reduced nickel content can be used safely in the "intermediate" temperature range of about 1200 to 1600 F, it is reported in the *Battelle Technical Review* for May, 1954.

A. M. Hall, chief of Battelle's division of alloy development, has reported the properties of the alloy, designated at the HF grade. It contains approximately 20 per cent chromium and 9 per cent nickel and can be used to replace an alloy containing 26 per cent chromium and 12 per cent nickel, called HH grade. This is a saving in nickel of 25 per cent. Research shows that the two alloys are comparable in load-carrying ability at temperatures up to 1400 F. The HF grade, however, is superior in ductility, after heating, to the alloy with higher nickel content. That means the lower-nickel alloy is superior to the HH alloy for repair and maintenance operations.

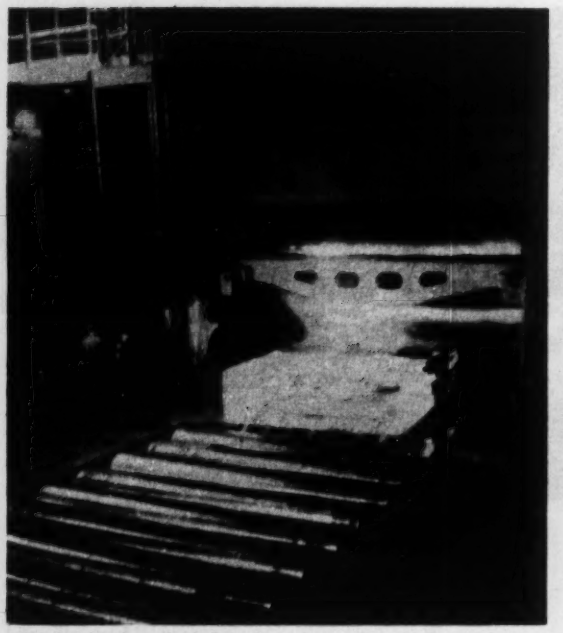
How to Obtain Further Information on "Briefing the Record" Items

Material for these pages is assembled from numerous sources and aims to cover a broad range of subject matter. While few quotation marks are used, passages that are directly quoted are obvious from the context, and credit to original sources is given.

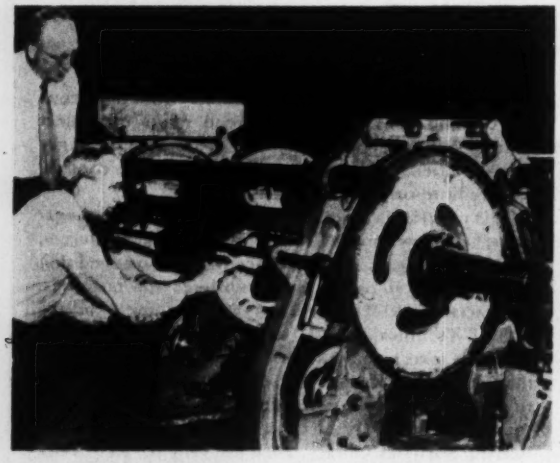
This material is abstracted from: (1) technical magazines; (2) news stories and releases of manufacturers, Government agencies, and other institutions; and (3) ASME technical papers not preprinted for meetings. Abstracts of ASME preprints will be found in the "ASME Technical Digest" section.

For the texts from which the abstracts of the "Briefing the Record" section are prepared, the reader is referred to the original sources; i.e. (1) The technical magazine mentioned in the abstract, which is on file in the Engineering Societies Library, 29 West 39th St., New York 18, N. Y., and other libraries. (2) The manufacturer, Government agency, or other institution referred to in the abstract. (3) The Engineering Societies Library for ASME papers not preprinted for meetings. Only the original manuscripts of these papers are available. Photostat copies may be purchased from the Library at usual rates, 40 cents per page.

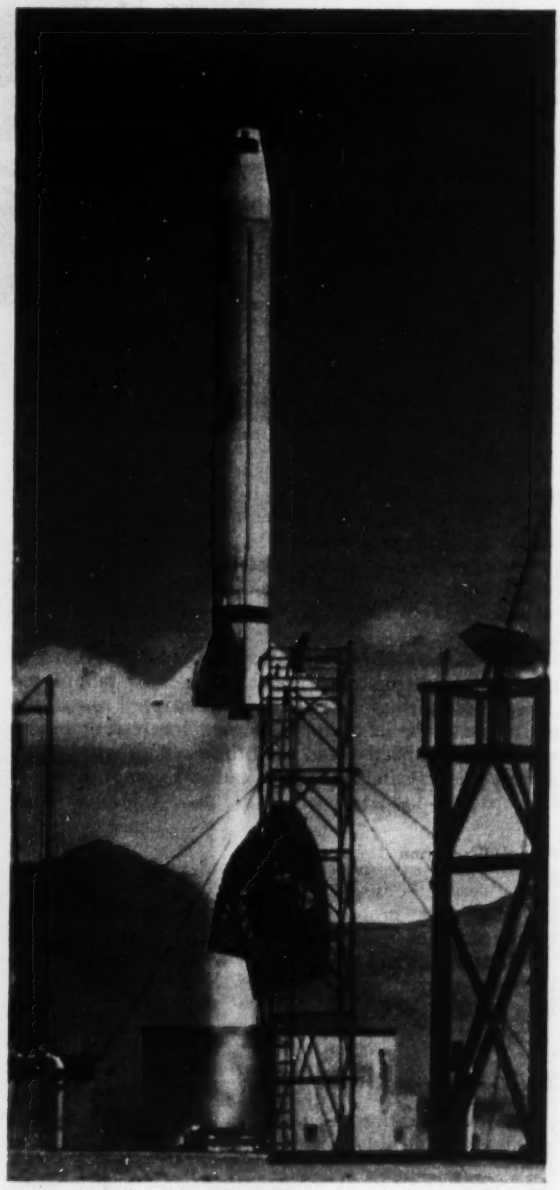
Engineering developments . . . at a glance



Heavy Plate Rolling. The Lukens Steel Company's big 206-in. mill, said to be the largest in this hemisphere, is shown rolling the heaviest steel plate ever produced. This rolling produced a finished plate weighing 47 $^1/_2$ tons from an ingot—measuring 123 in. × 108 in. × 40 in.—weighing 76 tons. These big plates, up to 25 in. thick, provide industry with heavy presses, big flywheels, high-pressure steam-generating equipment, and heavy frames that otherwise require expensive forgings.

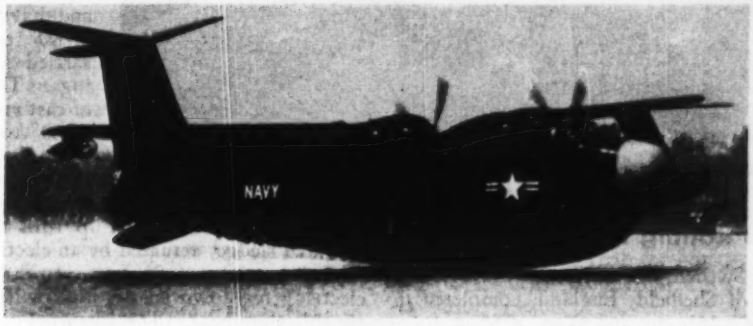


Wire-Stranding Machine. With this new high-speed wire-stranding machine, production of flexible wire rope for excavating shovels, cranes, and various types of hoists will be accelerated in the Wire Rope Division of John A. Roebling's Sons Corporation. The 175-ft strander twists anywhere from 26 to 46 separate wires into strands for the fabrication of wire rope up to 1$^5/_8$ in. in diam. It is driven by a 150-hp engine. Wire rope made from these strands can lift loads weighing up to 25 tons.

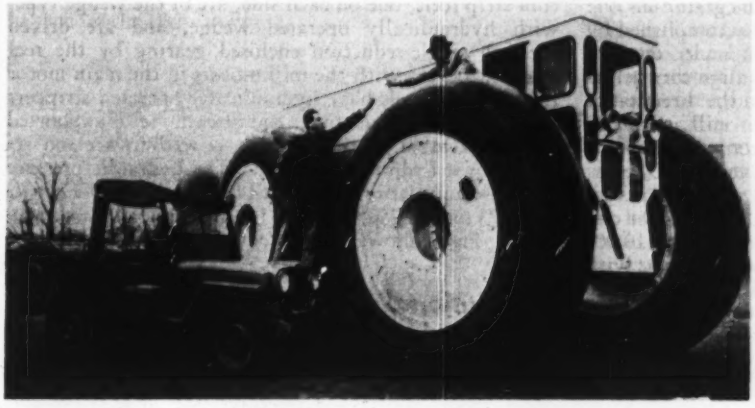


158 Miles Up. Off to a new world's record, the Navy's Viking No. 11 roars up from its launching stand at White Sands Proving Ground, N. Mex., at 4300 mph. The Viking, built by the Glenn L. Martin Company, Baltimore, Md., climbed to 158 miles—a new record for single-stage rockets. While in flight, the Viking radioed data on its performance and revealed secrets of the upper atmosphere to ground observers and recording instruments. This Navy rocket was fired on May 24, 1954.

Rocket-Assisted Takeoff. A Boeing B-47-B takes off, assisted by the largest rocket power units ever designed for aircraft. The power plants, known as RATO (Rocket-Assisted Takeoff), have been developed and produced by the Aerojet - General Corporation, Azusa, Calif. The high-thrust liquid-propellant rocket installations provide added power at takeoff, permit heavier pay load, increased range, and the use of shorter runways. The dual installation is contained within the fuselage. The power plants extend when in use; when not in use, the power plants are retractible, leaving the aircraft in a "clean" condition.



Antisubmarine Warfare Seaplane. Roaring down the Chesapeake Bay on its maiden flight is this Navy P5M-2 Martin Marlin—latest addition to the Navy's stable of sub-killing aircraft. The P5M-2 is now in quantity production at The Glenn L. Martin Company, Baltimore, Md. It is equipped with the latest electronic devices designed to search out enemy submarines and armed with a lethal load of depth charges and rockets for the kill. Increased power in the form of advanced 3400-hp Wright Cyclone turbocompound R-3350-32W engines give the P5M-2 a greater range and speed and permit operations at higher gross weights.



Marsh Buggy Drafted. An experimental model of the famous Marsh Buggy is given a final test at Gulf Oil Laboratories, Pittsburgh, Pa., before being shipped to the Army for tests. The huge vehicle can do transport work in terrain which would stop any other automotive device. Its 10-ft balloon tires, among largest in the world, enable it to navigate like a motorboat, to climb steep banks, and cross boulder-strewn or soft-sand beaches, and traverse bottomless mire. The cab is enclosed (in company use it had only a roof) to protect personnel and cargo in all kinds of weather. It has plexiglas windows, rides 6 ft above the ground, and accommodates 20 persons.

European Survey

Engineering Progress in the British Isles and Western Europe

J. Foster Petree,[1] Mem. ASME, *European Correspondent*

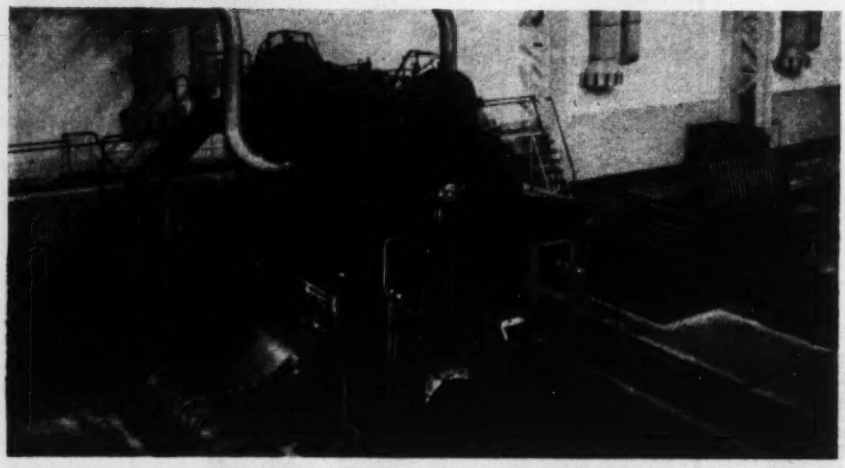


Fig. 1 56-in. cold-rolling mill for transformer sheet and strip complete for coil rolling

Sheet and Strip Rolling Mill

At Surahammar, Sweden, the Davy & United Engineering Company, of Sheffield, England, completed in April the erection of a $16^1/_2$-in. and 53-in. × 56-in. four-high cold-reduction mill to roll silicon steel for transformer sheet, for the Surahammars Bruks Aktiebolaget. The contract was handled in two stages, the mill being first put into service in 1953 for rolling sheets by hand feeding, with belt conveyers. The second stage, now completed, converted the mill to full mechanical operation by the addition of reels, stripper carriages, deflector rolls, etc., to enable it to handle the material in coil form. Thus, while retaining the facility to roll single sheets, it now operates mainly as a reversing strip mill.

The product is primarily steel for transformer laminations, with preferred orientation, i.e., the grain runs one way through the whole sheet. This is accomplished by alternate annealing and cold reduction under tension, which causes the crystals in the steel to align themselves with the most easily magnetized axes in the direction of rolling. On single-sheet rolling the mill normally handles steel with 1 to 3.5 per cent silicon up to a width of 1000 mm with a final thickness of 0.35 mm. However, it can cold-reduce sheets up to 1230 mm wide if required, with a maximum length of 3048 mm (10 ft). On coil rolling it will deliver the same steel in coils up to 10,000 lb weight and up to 1000 mm wide. Rolling starts with strip 2.74 mm thick, which is reduced to 0.74 mm and then annealed before the final reduction to 0.35 mm. The lower silicon grades, of $2^1/_2$ per cent Si or less, are rolled direct without intermediate annealing. The mill also will have to roll some stainless steel.

The drive is by a 2500-hp motor through a combined reduction gearbox and pinion housing, at speeds from 400 to 1000 fpm. The housings are one-piece steel castings weighing 95 tons each. The work rolls are of forged alloy steel with the barrels heat-treated and ground and have a Shore hardness of 90° to 95°. They are carried in SKF roller bearings. The back-up rolls are of cast steel with a hardness of 50° to 55° Shore and are supported in "Morgoil" bearings. The work rolls are changed by means of a porter bar and the back-up rolls by a hydraulically operated sledge, actuated by an electrically driven pump with a capacity of 25 gpm at 2000 psi. Two-motor electric screwdown gear is fitted with a magnetic clutch for roll alignment. The top working and back-up rolls are balanced hydraulically from a 10-gal air-hydraulic accumulator working at 2000 psi, supplied by a 5-hp pump, automatically controlled.

For coil rolling the mill is equipped with a drag generator cone-type uncoiler with cones 24 in. in diam and hydraulically traversed cone carriages and coil lift. On the ingoing side there is a six-roll feeder leveler to straighten and flatten the strip as it enters the mill. There are also two deflector rolls, one at each side, two parallel-lift strip wipers, two flying micrometers, and a clamp-type entry guide and strippers. The two 24-in. cold strip reels, one on each side, are of the wedge type, with hydraulically operated wedge, and are driven through single-reduction enclosed gearing by the reel motors, located with the mill motors in the main motor room. Both reels have hydraulically operated strippers and coil lifts, and the outer end of each reel is supported in a retractable bearing, which is withdrawn and replaced by a hydraulic cylinder. The hydraulic pressure for these auxiliaries is provided by a pump with a capacity of 25 gpm at 750 psi and a 100-gal air-loaded accumulator. Fig. 1 shows the mill equipped for coil rolling.

The National Foundry College

Since 1947 there has been a National Foundry College at Wolverhampton, England, where it was established by the Ministry of Education in premises adjoining the

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Technical College, though it is independently administered. The facilities afforded have been so much appreciated that, less than seven years later, new premises have had to be provided at a cost equivalent to some $375,000. The new building, formally opened on February 3, is in Stafford Street, Wolverhampton, and consists of three stories and a basement. It is fully equipped to give practical and theoretical instruction in all branches of ferrous and nonferrous foundry work and the testing and analysis of cast metals. On the first floor is a foundry, measuring 66 ft × 35 ft, which is claimed to be the only one in the British Commonwealth designed for the teaching of foundry techniques on an experimental basis. It contains a cupola, two gas-fired crucible furnaces, a high-frequency generating set operating an electric furnace, a variety of molding machines, a roller mill for sand preparation, shot-blasting and other fettling equipment, and means for pressure-testing castings. There are also a Durville casting table, a centrifugal casting machine, and a pressure die-casting machine. On the same floor is a pattern shop, fully provided with woodworking machines; a sand laboratory and an analytical laboratory; the library, and the office of the Principal, Mr. James Bamford, BSc. On the next floor are the research and metallographic laboratories, a room containing two Vickers projection microscopes, a polishing room, a heat-treatment laboratory, and an engineers' workshop. The top floor is devoted mainly to two large "diploma rooms" which can be used either separately or en suite for classes or other gatherings. The basement contains an x-ray room, photographic darkrooms, a blueprint room, and stores.

Projection-Type Rotary Table

For some years, Optical Measuring Tools, Ltd., of Maidenhead, Berkshire, England, have made a 16-in. rotary table of the projection type for use in jig boring and other precise machining operations. They have now produced a 30-in. table of broadly similar type, but designed to accommodate work considerably larger than the platen, thus greatly increasing its scope. This is done by providing two micrometer screens, one on the top of the base casting and the other at right angles to it, on the front, where it can be read from beneath an overhanging workpiece. The projection of the micrometer scale is transferred from one scale to the other by throwing over a small lever on the end of the table. It can be seen on the right in Fig. 2.

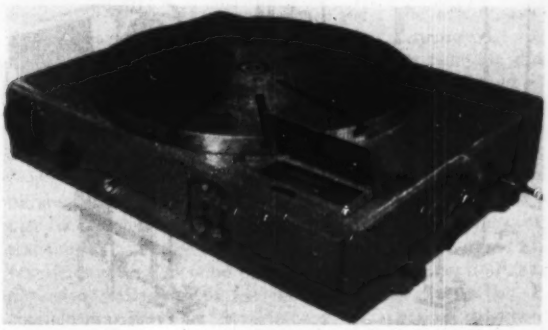


Fig. 2 O.M.T., Ltd., projection-type 30-in. rotary table

The platen has 12 radial T slots and is rotated through a worm drive by a 1/4-hp motor, taking 3-phase current at 440 volts and 50 cycles. The speed of rotation is 4 rpm. The angular movement can be read from a scale on the periphery of the platen, the final adjustment being made with the optical micrometer, which is operated by two knurled knobs near the front screen. Illumination of the screens is by a 12-volt 18-watt lamp, taking current from the main supply through a built-in transformer. The platen can be clamped instantly in any position, and the mechanical design is such that any wear which may occur will not affect the initial accuracy of the table. The over-all dimensions are 40 in. × 32 in. × 9 3/4 in. The weight is about 1350 lb. The distributors are Newall Group Sales, Ltd., Peterborough, England.

Blast-Furnace Performance

A comparison of the performances of similar blast furnaces, with and without high top pressure, was given by I. Lockerbie of the steelmaking firm of Colvilles, Ltd., in a paper contained in the recently published vol. 60 of the *Journal* of the West of Scotland Iron and Steel Institute. The furnaces were of identical dimensions, No. 1 being on normal operation and No. 2 working with high top pressure. In the 23 weeks covered, representing a total blowing time of 3864 hr, No. 1 was off blast for 74.4 hr and No. 2 for 70.2 hr, showing that the high top pressure did not interfere with production. The steam consumption with the high top pressure was 26.5 per cent higher than with normal operation, the average per ton of iron being 981 lb for No. 1 and 1241 lb for No. 2. The steam consumed per ton of coke was 1110 lb for No. 1 and 1437 lb for No. 2. The furnaces were being pressed for production throughout the 23 weeks, the blowing rates being the maximum practicable, but, in spite of the increased wind volume, No. 2 produced less flue dust than No. 1—1.05 cwt as against 1.37 cwt per ton of iron. Gas analyses showed that No. 2 consistently produced a better gas, even at comparatively high wind rates. Both furnaces were charged with the same ores, in closely similar proportions. The slag volumes were almost identical.

Sir Charles Parsons (1854-1931)

June 13, 1954, was the centenary of the birth of Sir Charles Algernon Parsons, by whose death in 1931, it has been truly said, "the engineering industry lost one of its greatest pioneers, and a benefactor of all time." He was born in London, the fourth son of a famous Irish peer, the third Earl of Rosse, who was, himself, a skilled engineer and even better known as a scientist and an astronomer. Parsons was only 30 when he constructed his first steam turbine, a 4-kw machine, with the blades machined from the solid on the periphery of brass rings; it consumed steam at the rate of 200 lb per kwhr, but sufficiently demonstrated the potentialities of a principle which, in another 30 years, was to transform the generation of electricity and the propulsion of ships, and, consequentially, the design of watertube boilers, though in this he took no active part himself. He died on February 11, 1931, while on a cruise to the West Indies.

ASME Technical Digest

Substance in Brief of Papers presented at ASME Meetings

Process Industries

Power and Recovery House, by E. Davalos and A. De La Macorra, Mem. ASME, Cia. De Las Fabricas De Papel De San Rafael Y Anexas, S. A., Mexico City, Mex. 1954 ASME International Meeting paper No. 54—Mex-12 (mimeographed; available to Jan. 1, 1955).

THIS paper describes typical problems for the paper industry and particularly for the San Rafael Paper Company which has developed continuously from one paper machine in 1890 to ten paper machines and several pulp mills today. With this development the steam and electric-power generation has not been able to keep up with the paper production. The company, therefore, decided to build a new power and recovery house which would be able to handle the increased pulp and paper production and the recovery of those chemicals now wasted in the Kraft pulp mill.

The recovery unit consists of an evaporator and a boiler. The evaporator is a five-body quintuple-effect evaporator obtaining maximum evaporation, flexible operation, and easy maintenance in this case. The boiler is a Stirling-type boiler with superheater and black-liquor spray mechanism.

For every ton of Kraft pulp produced the black liquor contains 3000 lb of solids. The Kraft pulp production being 55 tons per day, amounts to 165,000 lb of solids per day to be handled by the recovery unit.

Already having 425 psig steam pressure in the mill installations, it was decided to install boilers for this pressure in parallel with the existing boilers.

Working conditions of the turbine should be of a kind able to supply the mill with steam of required pressure. With this in mind it was decided to install one condensing turbine and one back-pressure-extraction turbine.

Installation of a water-softening plant in addition to the new boilers was essential and was to be placed in the new building.

The site of the installation was difficult to determine because the mill is situated on a sloped terrain and the new facilities had to be in the vicinity of the existing installations. A suitable area of 12,000 sq ft was chosen as close as possible to existing installations. A typical characteristic of the power and recovery house is that the same operating level exists for the power boilers, the recovery boiler, the steam turbines, the water-treatment plant, and on a covered way at the same level the induced-draft fans are to be installed. These fans will discharge into a new 180-ft-high and 8-ft-top-diam concrete chimney.

Engineering of Vacuum-Filter Station in Cane-Sugar Factories, by Lloyd Jacobsen, Oliver United Filters, Inc., New York, N. Y. 1954 ASME International Meeting paper No. 54—Mex-15 (mimeographed; available to Jan. 1, 1955).

THE paper discusses the design and construction of the various pieces of machinery and equipment comprising a cane mud-filter station. In addition, it covers in some detail the engineering involved in selecting, sizing, and laying out for installation of all the component equipment so that the filter station can be efficiently and economically operated as an integral part of the productive system of a sugar-cane mill.

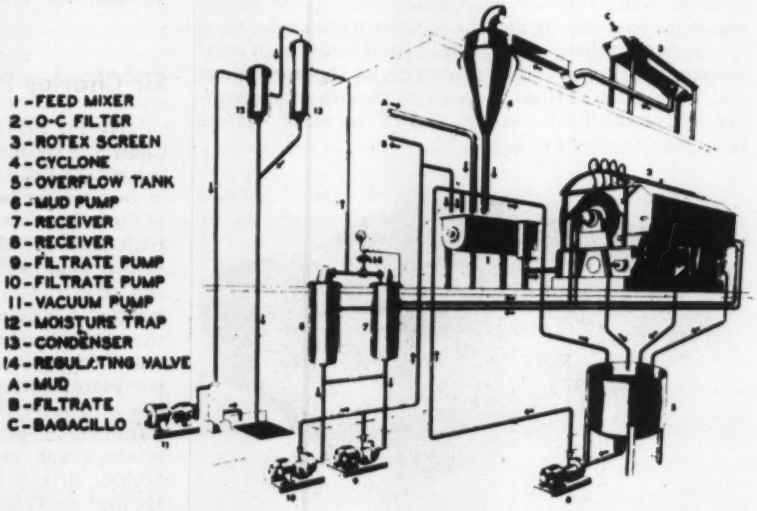
The following is a review of the basic pieces of equipment constituting a filter station:

The mud from the clarifier is run into a paddle-type feed mixer where bagacillo is added and then it flows to the filter tank. The bagacillo is obtained by various separating methods and then blown through a cyclone collector which discharges directly into the mixer. The mixer blends the slurry and it flows to the filter tank. The filter separates the mud and bagacillo from the sugar solution and before the cake is discharged it is washed with hot water to reduce its sucrose content to a minimum.

The cake is discharged into a conveyer or repulping trough where it is pumped or carried away for fertilizer or other uses.

The filtrate flows out the valves at the end of the filter trunnions into the strong and weak liquor receivers. The vacuum pump draws air and vapors through the filter, the receivers, and then a condenser and moisture trap to remove vapors and protect the vacuum pump.

A barometric leg and seal pit serve as an outlet for condensed vapors without interfering with the vacuum circuit. One centrifugal filtrate pump serves each receiver and the filtrate is usually returned to the lining tanks.



Artist's conception of layout of the Oliver-Campbell cane mud-filter station

To maintain a constant slurry level in the filter tank, overflow outlets are required and these empty into the overflow tank from which the mud pump returns the slurry to the feed mixer. The filter-tank drain connections are also generally piped to discharge into this tank.

The continuous-vacuum filter has many advantages over the various intermittent operations such as filter presses which it replaced, starting in 1927. Some of the main advantages of the continuous mud-filtration operation are briefly as follows: (1) Lower sucrose loss in filter cake. (2) Less inversion of sucrose and less resolution of impurities as a result of shorter filter cycle. (3) Efficient cake-washing reducing-water load in evaporators. (4) Higher purity of filtrate. (5) Cleaner filter station due to elimination of leaks, drippage, and spillage common with filter presses. (6) Labor-saving since one man can handle a battery of continuous filters; also, the filter station requires less supervision. (7) The continuous-vacuum filter requires less maintenance and occupies less space.

Refrigerating-Plant Performance Characteristics by Electrical-Analog Analysis, by C. F. Kayan, Mem. ASME, Columbia University, New York, N. Y. 1954 ASME International Meeting paper No. **54—Mex-11** (mimeographed; available to Jan. 1, 1955; to be published in Trans. ASME).

PREDICTION of the performance of a composite vapor-compression refrigeration plant proves difficult because of the many simultaneous variables in force at any one time. While the design of a system may be made in terms of initially set conditions, the actual operating conditions may be quite different from the original design. For example, a plant with a fixed compressor size designed to chill brine of a specified initial temperature and flow rate, under fixed condenser-coolant temperature and flow rate, actually may operate with brine of a different temperature. Under these circumstances, prediction of the performance of the composite system, as involving the plant equipment of fixed dimensions, may be quite difficult.

Investigation of performance under different operating conditions may be carried out through an extension of the resistance concept utilized in heat-transfer studies. Beyond this, the interdependent relationships for the system components may be investigated by electrical-analogy methods, wherein the performance values may be represented by electrical quantities.

This paper develops a means for predicting over-all performance characteristics of an integrated machine and heat-transfer complex. To this end electrical-analog methods are applied to the study of refrigeranting-plant performance.

Frasch Sulphur Mining, by James Woodburn, The Rice Institute, Houston, Tex. 1954 ASME International Meeting paper No. **54—Mex-13** (mimeographed; available to Jan. 1, 1955).

TO MINE sulphur economically by the Frasch process, two mutual factors have to be considered: the location, size, and geological formation of the deposit to be mined, and the above-ground apparatus required to mine it. The geologist supplies information from core-drill samples to outline the deposit and its particular formation and quantity of estimated available sulphur. From this the mechanical engineer can design the power plant, storage-water reservoirs, field sulphur-gathering system, bleed-water-disposal system, and sulphur-handling equipment.

This paper reveals some of the problems relating to the design and utilization of above-ground apparatus. The equipment and physical factors needed to employ Frasch mining are noted as are ideas which could reduce mining costs and increase efficiency. Problems of mining, handling, and storing sulphur are presented and some of the associated cost factors are analyzed.

The geological formation of such domes where sulphur was found in the Gulf Coast area of Louisiana and Texas consisted of a salt dome followed by anhydrite, sulphur-bearing calcite, calcite, and an overburden of clay and soil. Early attempts to mine the sulphur by conventional mining methods failed because of quicksands encountered just above the calcite cap. Herman Frasch divised the idea of drilling down through the calcite cap and into the sulphur-bearing calcite region under the cap and, by pumping down hot water, melt the sulphur, then pump it to the surface.

The sulphur-producing well consists of three concentric pipes. Between the outer pipe and the adjacent one, hot water is pumped down into the formation. The molten sulphur is lifted through the central pipe to the surface by means of a high-pressure compressed-air line similar to the airlift principle for water wells. Large central hot-water heating plants were erected to produce hot water for melting the sulphur underground and supply compressed air for lifting the sulphur to the surface. The average plant uses 3 to 5 million gal of fresh water per day for mining purposes, none of which is returned to the plant. Therefore a large chemical-treatment plant is also required to properly condition the water to prevent scale in the boilers and hot-water lines to the sulphur-producing wells.

To utilize the Frasch process, it is necessary to have a large underground sulphur deposit available, an adequate source and supply of fresh water, a cheap fuel, a proper bleedwater-disposal system, and finally, an easy means of transportation of the sulphur from the mine to the customer.

Metal Processing

A Contribution to the Knowledge of Pressure Measurements During Metal Deformation, by J. Frisch, Assoc. Mem. ASME, University of California, Berkeley, Calif. 1954 ASME International Meeting paper No. **54—Mex-19** (mimeographed; available to Jan. 1, 1955; to be published in Trans. ASME).

Two pressure-measuring devices using SR-4 strain gages and steel pins of $^1/_8$ in. and $^1/_4$ in. diam were inserted in the wall of an extrusion cylinder. During the extrusion of commercially pure lead, the mean pressure and radial wall stresses were measured and found to be in close agreement with the calculated values. The calibration of the instruments showed considerable difference between the curves obtained from deadweight calibration and those found from a simulation of the extrusion process.

A New Approach to Metal-Forming Problems—Experimental Stress Analysis for a Tubular Extrusion, by E. G. Thomsen, University of California, Berkeley, Calif. 1954 ASME International Meeting paper No. **54—Mex-16** (mimeographed; available to Jan. 1, 1955; to be published in Trans. ASME).

AN incremental inverted extrusion process was used to obtain magnitude and direction of particle velocities in a billet during the pressing of a tubular product. The material chosen was commercially pure lead which can be hot-worked at room temperature and is believed to be a representative species of hot-worked metals. The reported graphical technique using experimental data is applied to a problem presently unsolvable by analytical methods.

It was found that both axial stresses and mean pressures in the region of the die were higher on the extrusion axis and near the cylinder wall than in the

central region of the billet. This stress distribution is appreciably different from that of a solid extrusion for the same reduction in area. The present solution is a distinct advance in the direction of understanding three-dimensional metal-forming problems.

Hydraulics

Mechanism of Cavitation Inception and the Related Scale-Effects Problem, by R. W. Kermeen, Assoc. Mem. ASME, J. T. McGraw, and B. R. Parkin, California Institute of Technology, Pasadena, Calif. 1954 ASME International Meeting paper No. 54—Mex-1 (in type; available to Jan. 1, 1955; to be published in Trans. ASME).

An experimental investigation of incipient cavitation is described and the relationship between these experiments and current theories is discussed. Experiments have indicated that the cavitation number for inception varies with free-stream velocity and body size for both streamlined and bluff bodies. Preliminary studies of the mechanism of cavitation were conducted in order to understand the reasons for the variations in cavitation performance. Photographic investigations have disclosed the effect of the boundary layer on cavitation inception for both streamlined and bluff bodies. In addition, this study has shown that tensions exist in the flow of ordinary water at incipient cavitation.

The San Bartolo Vertical Impulse Turbine, by Javier Fuentes and Salvador Almanza, Comision Federal de Electricidad, Mexico City, Mex., and W. J. Rheingans, Mem. ASME, Allis-Chalmers Manufacturing Company, Milwaukee, Wis. 1954 ASME International Meeting paper No. 54—Mex-9 (mimeographed; available to Jan. 1, 1955; to be published in Trans. ASME).

The San Bartolo Hydroelectric Station, which is part of the Miguel Aleman Hydroelectric System of the Comision Federal de Electricidad, Mexico, was designed to operate about six months a year, during the dry season. During the rainy season, water will be stored in the reservoir above this plant. Because of this intermittent operation, certain economies in the design and construction of the power plant were possible.

The impulse turbine is a six-jet vertical unit which has certain advantages over a single-jet turbine, both in design and operating efficiency. Also, a vertical impulse turbine has a number of advantages over a horizontal unit, both in simplicity of design and in cost. The runner is of a unique design in that it is integrally fabricated out of plate steel with the bucket bowls welded directly to the wheel disk, thus eliminating bucket bolts.

A special needle-control mechanism permits operation of the turbine with any combination of six jets. The penstock shutoff valve consists of a rotary valve which proved to be satisfactory when tested in the shop.

Fuels Technology

Bagasse as a Fuel for Steam Generation, by F. D. Wilson, Mem. ASME, The Babcock & Wilcox Company, New York, N. Y. 1954 ASME International Meeting paper No. 54—Mex-6 (mimeographed; available to Jan. 1, 1955).

The use of bagasse, the residue remaining from sugar cane after extraction of the juice, as a fuel, is described. The author reveals the cost factors involved in handling and burning this fuel and notes the advancements made in furnaces and stoker equipment over the years. Also presented are some of the problems of ash and slag removal in sugar-refinery installations using this fuel.

The physical characteristics of bagasse vary widely. In the crudest form of sugar mill the cane is merely squeezed between two smooth rolls and the resulting bagasse is a flat semistiff ribbon about 5 to 6 ft long and approximately 2 in. wide.

Some mills have a series of crusher rolls and extraction mills. The resulting bagasse is of approximately the same texture as the first case but broken up into smaller pieces varying in length from 1 to 14 in.

In the most modern factories the cane is first run through a set of revolving knives, then a shredder, then through the extraction mills. The resulting bagasse has a large percentage of fines, between 15 and 20 per cent of the whole, and the remainder a mass of snarled and twisted fibers.

The paper discusses the following cost factors: (1) The basic cost as determined by its relative value for various uses. (2) The cost of transportation and handling. (3) The cost of labor necessary to facilitate the burning of the fuel. (4) The cost of equipment necessary to burn the fuel. (5) The cost of handling refuse from burning the fuel.

To make bagasse attractive from a cost standpoint, the equipment for burning it should be relatively cheap and simple to operate.

In most sugar mills today, bagasse is used as a fuel to produce steam in boilers. Fortunately, nature provided enough bagasse to make all the heat required in a sugar mill if it is properly designed and operated. Therefore the equipment for burning bagasse becomes very important and a major factor in determining cost.

There are at present two general types of equipment for burning bagasse—the hearth furnace and the grate furnace.

Bagasse Burning in the Mexican Sugar Industry, by Otto de Lorenzi, Fellow ASME, Combustion Engineering, Inc., New York, N. Y. 1954 International Meeting paper No. 54—Mex-4 (mimeographed; available to Jan. 1, 1955; to be published in Trans. ASME).

Bagasse is the principal source of heat for the production of raw sugar. Early furnace designs were satisfactory from the standpoint of operation and steam output during the period when labor was plentiful and this by-product fuel was assigned little or no value. Rising costs of fuel, equipment, repairs, and wages, however, have materially altered this picture.

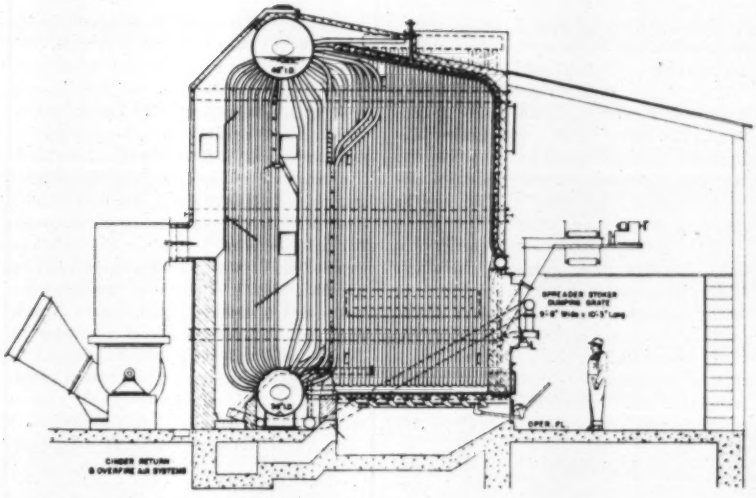
Older plants consisted of a multiplicity of small boilers with refractory hearth-type furnaces. Operating efficiency was low, and steam output dropped during long periodic hearth-cleaning periods. These designs are definitely outmoded through the rapid advances which have been made during the past 10 years.

Newer designs of steam-generating units now incorporate spreader stokers, water-cooled furnaces, bent-tube boilers, superheaters, air heaters, and bagacillo return systems. They have more flexibility, greater capacity, higher efficiency, and are less subject to operational interruption. Many units of this type have now been in operation for considerable periods of time in practically all of the world's raw-sugar-producing areas.

This paper discusses the operating characteristics of this new design as experienced with installations in Mexico. Comparative data is presented to stress normal operating differences between hearth-type and spreader-fired unit.

The Spreader Stoker in the Sugar Factory, by E. C. Miller, Mem. ASME, Riley Stoker Corporation, Worcester, Mass. 1954 ASME International Meeting paper No. 54—Mex-5 (mimeographed; available to Jan. 1, 1955).

The spreader-stoker-fired boiler provides the sugar producer with equipment that possesses advantages uniquely suited to steam-load demands and the normal fuel supply of the sugar factory. Combustion principles, component parts of



Pneumatic spreader-stoker-fired boiler provides 40,000 lb per hr steam; outdoor installation; bagasse and gas-fired; having dump grate and automatic controls

the spreader stoker, and engineering considerations in the application of spreader-stoker-fired boilers to the requirements of the sugar factory are explained in this paper.

Spreader-stoker firing of bagasse is the most recent development and advance in boiler practices of the sugar factory. A relative newcomer to the sugar factory, it has been used for other solid fuels for well over a half century. The spreader stoker is now the most popular type of firing solid fuels in the capacity range of 10,000 to 200,000 lb of steam per hr. This growth in the use of spreader stokers will continue, for the spreader stoker now permits the sugar factory to take advantage of power-plant practices that result in reduced capital investment, lower maintenance and labor costs, and high availability.

Spreader stokers possess inherent characteristics that make them readily adaptable to burning bagasse, the immediate fuel supply of the sugar factory. When burning bagasse, the spreader stoker spreads or scatters the bagasse over the grate. Heavy particles of bagasse fall to the grate and burn while the small particles quickly ignite and burn in suspension. Dispersion of the bagasse in the furnace gases produces flash-drying and instant ignition of the fine bagasse. The rapid drying and ignition also applies to the larger particles, much of which starts burning before it reaches the grate.

Ash accumulates on the grate beneath the burning fuel. Approximately 85 per cent of the air for combustion passes through the grates and the ash before it reaches the burning fuel, thus cooling both the grates and the ash on the grates. Even with very dirty bagasse, the absence of clinkers in ash is immediately noticeable.

An outdoor spreader-stoker firing installation, simple in design, is equipped with feeders, distributors, grates, overfire air, and cinder return as well as auxiliary gas burners.

Lubrication Activity

Factors Affecting Oil-Drain Practices for Diesel Engines, by L. F. Moody, Jr., and J. C. Gibb, Socony-Vacuum Oil Company, Inc., New York, N. Y. 1954 ASME International Meeting paper No. 54—Mex-3 (mimeographed; available to Jan. 1, 1955).

THE determination and establishment of appropriate oil-change periods for diesel engines is of serious concern to operators, owners, and engine builders. Oil kept too long in service results in dirty engines, often accompanied by excessive wear or damage to parts due to impaired lubrication. Unnecessarily frequent oil changes, on the other hand, are wasteful and costly.

Methods and techniques for the examination of used-oil samples are described and the significance of various oil-inspection tests is discussed. Consideration is given to the many factors influencing engine circulation-oil condition. Examples of used-oil analysis and interpretations are presented. These illustrate typical situations covering engine sizes, types, and service applications from automotive diesels to large slow-turning marine and electric-power-plant units of several thousand horsepower.

In normal operation of an engine the following conditions usually prevail: Less than perfect removal of abrasive material from the air entering the engine, less than perfect combustion leading to fuel-decomposition products that contaminate the oil, oil filtration not complete, operation of the engine under varying conditions of load and climates. These conditions result principally from: Fuel injectors out of balance or with poor spray pattern; poor cooling control, such as inoperative thermostats, dirty oil coolers, rust and scale in water jackets; poor fuels characterized by high end point, high sulphur, high-carbon residue or dirt; lack of filter and air-cleaner maintenance; infrequent oil-filter replacement; insufficient crankcase ventilation; and coolant leakage into the crankcase. These, in turn, produce certain changes in the lubricating oil, the degree of which guides the establishment of the drain period. Symptoms of these changes are the presence of organic insolubles from fuel and inorganic material from fuel and air, fuel dilution, and moisture. Nothing can substitute for careful analysis of oil and engine condition at regular intervals as the most reliable guide to establishment of proper oil-change interval.

The best oil cannot overcome the detrimental effects of poor maintenance, poor operation, and poor fuel. Careful control of these factors reduces the load on the oil and gives the operator the opportunity of longer drain periods consistent with longer engine life.

Materials Handling

Conveying Equipment in Cane-Sugar Mills, by C. C. Rinelli, Chain Belt Company, Milwaukee, Wis. 1954 ASME International Meeting paper No. 54—Mex-2 (mimeographed; available to Jan. 1, 1955; to be published in Trans. ASME).

THIS paper discusses the value and function of conveyers in cane-sugar mills. It deals with some of the basic factors and considerations involved in their operation. A solution of several problems of mechanical handling also is offered. Considerable emphasis has been placed on the application of chains, slats, sprockets, and other moving parts of the main conveyers and elevators in various sizes of cane-sugar mills.

The main types of conveyers used in the cane-sugar-making process are slat or apron conveyers in cane and inter-

mediate carriers, flight or scraper conveyers in juice strainers, bagasse carriers, and portable bag stackers, screw conveyers and grasshopper conveyers in sugar handling from the centrifugals, platform conveyers, bucket elevators, and belt conveyers in raw and refined sugar handling.

Grinding Capacities of Cane-Sugar Mills, by Jose M. Cabrera, Mem. ASME, Mexico City, Mex. 1954 ASME Annual Meeting paper No. 54—Mex-14 (mimeographed; available to Jan. 1, 1955; to be published in Trans. ASME).

THIS paper summarizes milling equipment in actual operation as listed in the "Gilmore Manuals of 1951," for Cuba, Florida, Louisiana, and Hawaii, and as of 1950, for Puerto Rico, Dominican Republic, and Haiti. Text with tabulations and graphs covers mill sizes, crusher types and arrangements, number of milling units in tandem, tonnage ground, sucrose in cane, fiber in cane, and maceration employed. It includes various curves comparing the capacities and extraction by mill sizes, crushing arrangements, and other data pertinent to the task of grinding cane.

Instruments and Regulators

A Recent Development in the Measurement of the Sugar Supersaturation Coefficient, by R. L. Miller, Minneapolis-Honeywell Regulator Company, Philadelphia, Pa., 1954 ASME International Meeting paper No. 54—Mex-18 (mimeographed; available to Jan. 1, 1955).

THIS paper is concerned with the design of an electrical instrument for the determination of sugar supersaturation. A short review of sugar-boiling problems and sugar supersaturation relationships is made to establish the design considerations.

Sugar boiling is not only complex but is perhaps the most important batch process in a sugar refinery. It is here that the quantity, size, and uniformity of the sucrose crystals are determined. The instrument described by this paper greatly simplifies operation of the process by improving the constancy of "seeding" and by enabling the operator to determine the supersaturation conditions most favorable to proper growth of the sucrose crystals.

The many highly developed forms of measurement and feedback control now available have permitted many industries to replace batch processes with continuous processes and have thereby improved their product. Some batch processes such as sugar boiling have not yet been replaced by continuous processes primarily because of the complex relationship of the variables.

The sugar supersaturation recorder described is essentially an easily manufacturable form of the instrument described originally by A. L. Holven and has been proved to be functionally equivalent by personnel skilled in the use of the Holven recorders.

The sugar supersaturation recorder provides an invaluable guide to the sugar boiler, particularly at the time of seeding and, in general, during all phases of the sugar-boiling process. It cannot be used, however, to control supersaturation automatically. Control of supersaturation involves syrup feed, absolute pressure, and the competence of the operator.

Oil and Gas Power

Diesel Plant Design—Influence of Fuels and Higher Engine Ratings, by Robert Cramer, Jr., Mem. ASME, Nordberg Manufacturing Company, Milwaukee, Wis. 1954 ASME International Meeting paper No. 54—Mex-10 (mimeographed; available to Jan. 1, 1955).

MANY of the principles in the design of diesel-engine power plants are empirical and have been established as a result of difficulties which have appeared in previous plants. These difficulties have been associated with the gradual increase in the ratings of the engines which have the effect of reducing the physical size of the engine-generator unit and the building required to house it, but have not necessarily reduced the size of the auxiliaries. The air and fuel consumed by an engine are proportional to its load regardless of the engine's physical size. The cooling requirements are also proportional to the load except for minor decreases due to the increasing thermal efficiency of internal-combustion engines.

All of these factors are changing the relationship of the size of the auxiliary equipment and the engine and increasing the importance of ventilation problems, which in many cases were previously unimportant only because buildings were large in relation to the horsepower of the engines which they housed.

The increasing use of heated heavy fuel and of natural gas also has brought new problems in the handling and preparation of engine fuel, particularly with regard to safety, fire hazards, and convenience for the operating personnel.

In the United States the sudden rise in the cost of refined diesel fuel during and shortly after the last war has made it economically imperative for many diesel power-plant managers to find fuels which will produce power at the lowest over-all cost. For those plants which are situated within reach of gas pipe lines, natural gas has been by far the lowest-cost fuel. It insures the lowest maintenance costs of any fuel now available.

Heavy fuels, both residual and blended, are intermediate in cost between natural gas and distillate fuels and provide a considerably cheaper source where natural gas is not available in sufficient quantity. However, heavy fuels, in general, bring increased maintenance costs and operating difficulties. Nevertheless, the savings in fuel cost may be 20 per cent to 50 per cent of the total and, even after deducting the increased maintenance, will be enough to enable a plant to compete with its utility neighbors.

Successful Application of Standardized Diesel-Electric Motive Power to the World's Railways, by Manuel Alonzo, American Locomotive Company, New York, N. Y. 1954 ASME International Meeting paper No. 54—Mex-8 (mimeographed; available to Jan. 1, 1955).

IN MEXICO the Sonora Baja California Railroad has operated diesel-electric locomotives through 330 miles of the desert of Altar since early in 1949. The temperatures there reach 120 F during the summer, only to drop sharply at night. In addition, sand can be kept out of the running machinery. Under these conditions, diesel-electrics have given 65,000 miles of dependable service a year per locomotive, and the oldest units have not yet received a major diesel-engine overhaul.

The great problem encountered in railroad operations in the tropics is manpower. In these territories it is difficult to obtain the quantity and quality of maintenance required to keep a locomotive in service.

The diesel-electric locomotive, which can go great distances without servicing, enables the railroad to concentrate maintenance personnel in its terminals.

The type of 4-stroke turbosupercharged diesel engine discussed in this paper has proved conclusively that it can conquer high altitudes.

In the Socompa Line of the Argentine State Railways, these engines are operated over 14,000 ft above sea level. At these extreme heights they still pull the same tonnages they were given in the lower valleys, without helpers—proving their ability to perform equally well regardless of altitude.

Thus far, the toughest winter conditions encountered by diesel-electric locomotives have been found in northern Canada. Here the diesel unit, operating

daily through winter temperatures ranging as low as 30 to 40 C below zero, has proved that this type of power plant is not affected by low temperatures. The colder intake-air temperatures, which reduce the efficiency of the steam locomotive, actually increase the efficiency of the diesel engine.

It often has been claimed that the diesel-electric locomotive can solve the problem of long distances with poor-quality water or no water supply at all. This problem has been encountered in many areas of the world. Experience both in the U. S. and abroad has more than proved this claim made for the diesel-electric.

Power Generation

The Maintenance and Operation of the Tacubaya Diesel Plant, Mexico City, by J. K. Jennings, Mem. ASME, The Mexican Light & Power Company, Mexico City, Mex. 1954 ASME International Meeting paper No. **54—Mex-20** (mimeographed; available to Jan. 1, 1955).

THIS paper describes the operations of the Tacubaya diesel plant, an important segment of the Mexican Light & Power Company's vast power system. Operating and maintenance data of the Tacubaya plant are given. Routine plant-operating procedures are outlined, including overhaul, water-treatment, and lube-oil-recovery methods. The principal causes of outages are noted and a breakdown of maintenance and operating costs is presented.

The Tacubaya diesel plant was completed early in 1949. The plant comprises six Nordberg 12-cyl, 29-in. × 40-in. two-cycle mechanical-injection engines driving General Electric 6450-kva generators. The total capacity of the plant is 30,900 kw and the sea-level rating of each engine is 8650 hp at 167 rpm. The six engines are placed side by side in the central aisle of the plant with the auxiliaries arranged in a side aisle. The spacious arrangement of the equipment has greatly facilitated maintenance work.

Management

Wasted Manpower, by T. W. Bigger, Mem. ASME, Scotia, N. Y. 1954 ASME Management Conference paper No. **54—Mgt-1** (mimeographed; available to Jan. 1, 1955).

MANY people have observed in recent years the relatively large numbers of highly trained and intelligent men who, usually in the age range between forty and sixty, have suddenly cracked up or reached an untimely end. Their difficulty is often reported as some form of heart disease.

There is reason to believe that many of these men are victims of too much first-hand acquaintance with such tension-producing emotions as anxiety, apprehension, fear, rage, hatred, impatience, frustration, or specifically, any emotion which stimulates the flow of adrenalin. If this continues over long sustained periods it seems to be impossible for the person to relax and to get sufficient rest.

The author believes that you can make more adrenalin in a workday of impatience or rage than one with a sedentary occupation can normally consume within the worktime, and unless the larger muscles are brought to play daily to consume this adrenalin, it may still be in oversupply through the night. In a few years the heart muscle is tired enough to be painful from the extra beating it has been forced to do, or loses its rhythm, and it is called heart disease.

It is the author's opinion that many deaths which occur in middle age are customarily reported as heart failure when the heart is really the victim of a long sustained oversupply of adrenalin.

These victims of "heart disease" fall into two classes: (1) Those who bring it on themselves, and (2) those who are the victims of circumstances or of one or more associates. Both of these classes should learn the effects of the tension-producing emotions and learn how to relax and live well with their emotions.

Co-Ordinating Engineering Activities in a Complex Organization, by R. B. Read, Westinghouse Electric Corp., Pittsburgh, Pa. 1954 Management Conference paper No. **54—Mgt-2** (mimeographed; available to Jan. 1, 1955).

To realize the full potential of its engineering manpower, a company must co-ordinate not only one engineering activity with another, but also integrate engineering with the manufacturing and sales functions. This paper outlines a program where decentralized but co-ordinated responsibility helps achieve efficient operation of a complex organization.

According to the paper, engineering alone, by seeking to co-ordinate its activities with the sales and manufacturing areas, cannot bring about maximum performance. Co-ordination of engineering with the other two activities and the integration of all three into a hard-hitting and purposeful organization is much more likely to result if each of the activities is programmed within a well-conceived planning framework.

Such a framework might consist of two essential parts:

1 A statement of broad "product policies" within which the operations of the division will be conducted.

2 A carefully established set of long-

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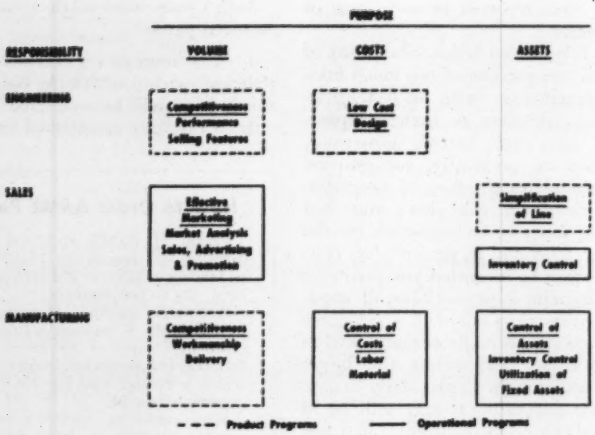

Product Plans. Block diagram illustrating the relationship of the principal factors of performance objectives, by purpose, identified to the functional responsibility.

term "performance objectives" toward which the operations are aimed.

Programs must be developed in support of the objectives for each product line—programs which are solid and concrete and which make specific and scheduled assignment of responsibility to all of the functional activities concerned in the profit-improvement plan.

This point—the specific planning for the profit improvement of each line at the operating-division level—is the critical point. Here is determined whether the planned actions of the engineering department are co-ordinated with those of sales and manufacturing, and vice versa.

In conclusion, the paper stresses these matters: The importance of a soundly conceived, company-wide framework of planning within which well-defined objectives are established; the force which can generate from a decentralized organization in which the direction of planning is upward from the product line, not downward; and last, the co-ordination possibilities offered by an approach in which the activities of engineering, sales, and manufacturing are all focused toward the single-minded purpose of return on investment.

Organization and Management of a Sales Engineering Department, by Ralph J. Kraut, Giddings & Lewis Machine Tool Company, Fond du Lac, Wis. 1954 ASME Management Conference paper No. 54—Mgt-5 (mimeographed; available to Jan. 1, 1955).

This paper is concerned with some of the problems involved in managing a technical sales department. Using the machine-tool industry as an example, it discusses the following aspects of sales engineering: (1) Definition of sales engineering and its area of responsibility, (2) function of sales engineering, (3) qualifications of the sales engineer, (4) management responsibilities, and (5) problems in management.

The service of the technical sales department is a very important factor in the selling job, for here the many problems arising from demands for high-volume production, with its many special requirements, are solved. The sales engineer's analysis of the customer's problems must cover every contributing factor such as quantity, size, tolerances, materials, and finish requirements of the parts to be produced. It must then establish the most efficient machining methods, as well as the proper type, size, and capacity of the machine to be used. The results of this analysis will either adapt a standard machine through fixtures and attachments, or propose a design of a special machine to meet the exact requirements—fully conscious of the cost in relation to performance and investment.

In addition, sales engineering helps the customer select the proper tooling for the job to be done. It plans a sequence of operations designed to minimize the number of setups, as well as to take optimum advantage of the machine's working range and capacity. It must offer counseling service on the many problems arising from such factors as product design, new workpiece and cutting-tool materials, and increased production schedules. And it must help to keep the purchased equipment operating at maximum efficiency with minimum maintenance cost. It is a service to the customer through a study of the problems involved in determining the right machine or piece of equipment to handle the particular work. In short, this service specializes in solving out-of-the ordinary problems for the customer.

ASME Transactions for June, 1954

The June, 1954, issue of the Transactions of the ASME, which is the *Journal of Applied Mechanics* (available at $1 per copy to ASME members; $1.50 to nonmembers) contains the following technical papers:

Stresses in a Tube Under High Radial Temperature Variation, by Chieh-Chien Chang and Wen-Hwa Chu. (53—A-4)

Stresses and Deformations of Flanged Shells, by G. Horvay and I. M. Clausen, Jr. (53—A-43)

Nonlinear Deflection of Membranes, by F. S. Shaw and N. Perrone. (53—A-36)

Bending of Plates by Concentrated Couples and Forces, by Yi-Yuan Yu. (53—A-32)

Plastic Flow in a Notched Bar, by E. H. Lee. (53—A-29)

Transmission of Tension From a Bar to a Plate, by J. N. Goodier and C. S. Hsu. (53—A-41)

A Curved Bar With Tangential Boundary Loads, by Ning-Gau Wu and C. W. Nelson. (53—A-47)

On the Equations of Motion of Cylindrical Shells, by P. M. Naghdi and J. G. Berry. (53—A-34)

Vibrations of Shells in an Acoustic Medium, by H. H. Bleich and M. L. Baron. (53—A-37)

Frequencies and Modes of Cylindrical Shells, by M. L. Baron and H. H. Bleich. (53—A-33)

On the Thickness of Normal Shock Waves in a Perfect Gas, by A. H. Shapiro and S. J. Kline. (53—A-35)

Brief Notes

The Delayed Hot-Water Problem, by Walter Munk.

Plastic Potential Theory and Prandtl Bearing Capacity Solution, by R. T. Shield.

Comparison of the Hardening Produced in a Yield-Point Steel by Uniaxial Loading Under Static and Under Dynamic Conditions, by D. B. Harris and M. P. White.

Note on the Problem of Vibrations of Slightly Curved Bars, by Eric Reissner.

General Solution for Nonuniform Hinged-End Columns, by L. H. Donnell.

Method of Computing Principal Strains, by N. J. Taleb.

Use of Double-Exposure Photography in Photoelasticity, by W. M. Koch and P. A. Szego.

Discussion

On previously published papers by E. Levin; N. C. Dahl; P. Dergarabedian; R. A. Anderson; J. Miklowitz; J. E. Johnson, D. S. Wood, and D. S. Clark.

Book Reviews

Comments on Papers

Including Letters From Readers on Miscellaneous Subjects

Diesel Locomotives

Comment by Kenneth Cartwright[1]

The author is to be congratulated for presenting a clear and concise outline[2] of the problem of standardizing diesel-locomotive parts and the course of solution to be followed.

The diesel-electric locomotive offers much greater possibilities for standardization than any other type of motive power ever employed by the American railroads. With the steam locomotive, because of the difference in operating conditions as between different railroads and even between different divisions of the same railroad, it was necessary to custom-tailor the design to meet the conditions. With the diesel, this is not necessary. The same basic unit, with only a change in gear ratio, will meet the requirements of any railroad in the country for any service, freight or passenger. The total power requirement is obtained by building up the necessary number of basic units, operated by one crew in multiple, as required. What a field this offers for standardization and what it could mean to the railroads if achieved!

An Example of Standardization

One of the most striking examples of the benefits to be derived through standardization of equipment and methods was shown by the speed with which telephone communications were restored in the Southern New England States after the disastrous hurricane of 1938. Telephone repair crews and trucks from as far away as Texas went to work in restoring facilities in Connecticut where they found the same standardized equipment and used the same methods of repair as they would in their own state. If different equipment and methods had been employed, the job of restoration would have been prolonged greatly.

The writer does not believe that it is feasible or desirable to attempt to standardize the diesel locomotive to the same extent that telephone equipment is standardized. Today there are four builders of diesel engines and three builders of generators, control apparatus, and traction motors. To try to standardize these four basic components would result in arresting further development. It is possible, however, to standardize nearly all of the purely mechanical components of the diesel locomotive and many of the auxiliaries—at least to the point where they would be interchangeable as a unit. Such standardization could be accomplished and would result in measurable economies to the railroads. But will it ever come? It is to be hoped that it will not take the authority of the U. S. Government to accomplish this as in the case of rolled-steel-wheel designs mentioned by the author.

Why the Lag in Standardization?

Frankly, the writer believes that, while there is a great deal of talk among railroad mechanical people about standardization of diesel locomotives, it is open to question whether or not they really want it. The trouble is that in one sense the diesel came too fast. The result is that today a number of railroads are 100 per cent dieselized. Every railroad with perhaps one exception has a considerable percentage of diesels in its motive-power pool. Now when management of a road orders additional diesels, what do they want? In the majority of cases they want a diesel conforming in so far as possible with some class of diesel already in operation so that there will be the least possible increase in the inventory stock of materials required for maintenance. Let us look at the record.

In 1945 the Locomotive Construction Committee of the Association of American Railroads started to work on the standardization of trucks for 600 to 1000-hp switchers. This work resulted in the design of an interchangeable truck for 600 to 1000-hp switchers that was approved by letter ballot and entered in the AAR Manual as Recommended Practice in 1947. This was followed by similar approval by letter ballot of the details of the various components of the truck as "Recommended Practice" in 1949. The general design and details are covered in the AAR Manual.

Thus in 1949 we had a complete detailed design of an interchangeable truck for 600 to 1000-hp switchers. Now this truck is a good truck. It was designed in collaboration with the locomotive builders and the truck-frame manufacturers. Any builder's traction motor could be applied. It represents an immense amount of work on the part of the subcommittee of the Locomotive Construction Committee, the locomotive builders, and the truck people.

There have been diesels built since 1949 to which this truck could have been applied, but no diesel has yet been built and equipped with this truck. Why? Well, it is only in the AAR Manual as "Recommended Practice."

It is not mandatory to have a 600 to 1000-hp diesel switcher equipped with this truck. The locomotive builders will not use it unless required by the customer. They cannot be blamed. It means a departure in some respects from existing practice. The customer does not specify this truck. To do so would mean that it would be a little different in some respects from the truck on the last lot of diesels to be placed in service. The axle might be a little different, or the boxes, the spring hangers, or some other equipment. So the customer goes along and takes the same truck he had and doesn't worry about any increase in material inventory for maintenance.

I submit that until such time as standards for any elements entering into the assembly of a diesel are made mandatory there will be very little real standardization accomplished. It is, in the first instance, going to cost money to introduce interchangeable standards and will result for a time in the necessity of stocking some additional parts inventory. In the long run, however, it will result in measurable economies and greatly reduced maintenance material stocks. There is no valid reason why an interchangeable four or six-wheel truck cannot be developed for road locomotives. Traction motors can be designed, suitable for application to such a standard truck with-

[1] Consulting Engineer, The New York, New Haven & Hartford Railroad Company, New Haven, Conn. Mem. ASME.

[2] "Standardizing Parts on Diesel Locomotives," by C. K. Steins, MECHANICAL ENGINEERING, vol. 76, January, 1954, pp. 29-30.

out restricting the electrical features of the design. All purely mechanical parts of the locomotive can be standardized. Many auxiliaries such as air compressors, filters, etc., can be standardized in so far as the application to the locomotive is concerned. This can all be accomplished without placing any restrictions on the builder with respect to the design of the diesel engine, generator, electrical features of the traction motors, or the control system. It should not affect the relative competitive position of any of the builders. It will, however, result in greatly simplified maintenance inventories for the railroads and unless and until such arbitrary and mandatory standards are introduced anything that may be done will not, in my opinion, greatly relieve the present situation.

Comment by A. G. Hoppe[3]

Standardization is a highly desirable move in any industry when such standardization will not stifle progress. The author points out may instances where standardization would have no effect on the performance of the locomotive and certainly would not in any way interfere with the further development of the power-producing or power-using equipment. For such railroads as buy locomotives from all sources, standardization of many items would be a boon indeed.

These railroads undoubtedly are in a predicament. What to do about it? In examining this situation we must consider what has happened on the American railroads in a very short space of time. There was a mild interest in diesel-electric locomotives following the first world war. By 1932 there were about 125 locomotives of this type in all services, mostly switching, as an answer to smoke ordinances in larger cities. Even by 1937 there were only 234 locomotives (245 units) in all services, but with an indication of the use of diesel electrics in road service, there being 2 locomotives assigned to road freight and 16 to road passenger. Following 1937, the change to diesels began to gather speed and by 1947 the railroads reported a total of 3624 locomotives in all services. By the end of 1952 a number of Class I railroads had eliminated the steam locomotive entirely. Reports from 27 of 32 representative Class I railroads showed the road traffic still handled by steam locomotives (see Table 1).

Thus, in the short space of 15 years, we have witnessed not only the development of a new type of motive power, but have seen that type replace the steam locomotive to a very large extent.

TABLE 1

Traffic by steam locomotive, per cent	Number of railroads—Freight service	Number of railroads—Passenger service
0 to 5	12	12
6 to 25	4	9
26 to 50	6	4
51 to 75	3	0
76 to 99	1	1
100	1	1
Total	27	27

The Manufacturer's Approach

Consider further that in the early phase of this period, the builder most active predicated the construction of diesel-electric locomotives on the basis of standard locomotives which could be produced in large numbers for all railroads, with no variations except the paint job. As the pioneer in this field the manufacturer obviously found it necessary to establish many details not used previously in locomotive or car construction. However, in some instances, perfectly good and recognized practices were discarded. Specific examples are the journal bearings and wedges used on the switching locomotives.

As the next two builders entered the field they also adopted the policy of a basic design of locomotive but, unfortunately, each went his own way in the design of major items of equipment and in the details of the auxiliary and accessory equipment. Trucks and contained parts such as axles, bearings, springs, and spring rigging, all were made different. Couplers, as the author pointed out, were a fertile field for showing individuality, even though in some instances the changes were so small as to be ridiculous.

The fourth builder, in the beginning, offered switching locomotives only, and whether by choice or necessity used existing electrical equipment and adopted a complete truck, including traction motors and gears, already used by one of the other builders. When this builder decided to build his own electrical equipment for switching locomotives he wisely produced a traction motor both mechanically and electrically interchangeable with the previous line. Thus we do have the switching-locomotive trucks of at least two of the builders completely interchangeable both as units and in their contained parts. When this builder began the production of road locomotives he also went his own way in the matter of truck design, introducing an entirely new line of trucks with each model offered.

The builders of diesel-electric locomotives, with a market clamoring for their product, had no incentive or, if you please, no reason for conforming to the practices of other builders. In fact, they had the argument, often repeated, and actually with much in its favor, that here was a new field in the development stage, and the designer should not be held down to copying previous practices and only time would tell which design of truck or other major items of equipment would prove best.

What to Do About It?

What can be done at this late date to bring about at least some measure of orderliness in this confused situation? It appears, for the time being at least, that standardization of such major items as trucks, traction motors, and gears is impracticable. As shown by the figures cited, a number of roads are now or will very shortly be completely dieselized, but the motive power is all comparatively new. These railroads already are saddled with a multiplicity of trucks and their contained parts, traction motors, and main generators. In many instances they already have provided themselves with spare units to protect the various main parts or assemblies. Consequently, standardization now of any of these major items of equipment or major assemblies can be achieved only at a prohibitive cost and the retirement of much good and usable equipment.

The present situation appears rather gloomy and at times hopeless. What about the future? The initiative undoubtedly rests with the railroads, since the builders have shown no interest in complaints registered at various meetings of mechanical men. Here again it may be well to examine some fundamental facts. The obvious body to undertake the development of standards is the Mechanical Division of the Association of American Railroads, and the Committee on Locomotive Construction is the obvious starting point. Locomotive standards, however, are not mandatory and the information published heretofore, except in rare instances, has been in the form of a recommended practice.

There are details, particularly expendable items, items subject to frequent replacement because of wear, and connections between units that can be standardized, if not completely, certainly as to dimensions. The process under the present situation is a long and time-consuming one. First, a survey is made to determine present practices of the various

[3] Mechanical Engineer, Chicago, Milwaukee, St. Paul & Pacific Railroad Company, Milwaukee, Wis. Mem. ASME.

members. Then a compromise is offered to the railroads for adoption as recommended practice, which if accepted is published in the Manual of Standard and Recommended Practices. To date, this generally ended the matter. The practice was available but no compulsion to use it, and certainly no concerted action on the part of the railroads in demanding such practices on their locomotives, except in a very few isolated instances.

It is admitted freely that progress toward standardization of diesel-locomotive parts has been to all intents and purposes nil. Much of this is due to the circumstances previously outlined. Another reason, and a fundamental one, is that the men working on the subject are attempting to handle it in addition to their daily duties, and hence at best it receives only secondary consideration. It seems that if the railroads are serious about standardizing parts and practices for diesel locomotives, and hope to make reasonable progress, that this is a full-time job for several men.

Much has been accomplished in the past by co-operation between the manufacturers of items and the various committees of the Mechanical Division. Most of such items, however, have concerned freight cars where, once an item or practice is adopted as a standard, it becomes a part of the Rules of Interchange and is henceforth binding on the member roads on or for cars used in interchange, with penalties assessed for failure to comply. Any standardization on locomotives is purely voluntary, both on the part of the railroads and on the part of the builders or suppliers of equipment.

Accessory Standardization

To date, owing to competition and the demand for locomotives, there has been no particular reason for the builders to get together on anything. In a development as rapid as that of the diesel-electric locomotive, changes are inevitable even at times in major items of equipment if improvement is to be accomplished. By and large, the builders have made such changes in a manner that permitted conversion of existing equipment to later and better models. Presumably, the end is not yet in sight nor should it be. However, much can be done to avoid unnecessary differences in accessories, particularly as to dimensions, location, and arrangement of electrical and pneumatic connections.

The author points out the desirability of a standard arrangement of cabs for switching locomotives. In this matter, the Committee on Locomotive Construction made an attempt. A survey, however, disclosed such wide variation in essential dimensions, to which no serious objections were raised, that any compromise arrangement which would be accepted and used appeared unlikely.

The situation is, to say the least, somewhat confused. Whether it is hopeless or not depends on whether the builders and the railroads can get together and agree on what the builder will supply and the railroads will use, there being at present no compulsion on either.

Comment by L. F. Smith[4]

The matter of standardization has been dealt with at length by the subcommittees of the AAR Committee on Automotive and Electric Rolling Stock. Additional items of interest now being studied by the subcommittees are as follows: 1 Standardization of traction-motor lead connections. Westinghouse in co-operation with the committee has been working on this and progress is being made toward developing a working model for study. 2 Standardization of traction-motor leads for various types of motors from a length standpoint. 3 Standardization of load-indicating meters. 4 Standardization of fuel pumps and motors.

Additional stress should be placed by the individual locomotive builders on their own different models of the same-type power. To best illustrate this, consider Models RS-1 and RS-3 road switchers as built by ALCO. The RS-1 was delivered with Model GT-564 main generator, Model GY-24 auxiliary generators, and Model AM-807 amplidyne-exciter whereas the Model RS-3 was delivered with Model GT-581 main generator, Model GT-27 auxiliary generator, and Model AM-808 amplidyne-exciter. These items are not interchangeable and result in our having to stock spares for protection to each locomotive model, which is double the expense if not more.

Then there is the matter of cab and car-body glass sizes. This matter has been dealt with extensively before but considerably more should be done toward this item not only by the different builders but on the same builders' locomotives. This is also an expensive item as many sizes must be carried in stock.

The matter of standardization of wiring diagrams also is being studied which should prove of great benefit since it has been found quite difficult to read the various diagrams, particularly by the shop personnel. Each builder generally uses a different system utilizing different symbols and markings.

[4] Mechanical Engineer, Southern Railway System, Washington, D. C.

Adding further to the author's statement concerning motor-suspension bearings, one manufacturer bores the oil relief into the wick window on both sides, another on the flange side, then another on neither side. Certainly a conclusion can be reached as to the best method. Such differences are confusing to the shop mechanics who maintain more than one type of locomotive.

Multiple-Unit Controls

Multiple-unit control equipment has given us a real problem, requiring a great deal of study and effort to cope with it. Recently, in operating locomotives of different manufacturers in multiple, many difficulties had to be surmounted, in spite of assurances from both builders that the locomotives would multiple together.

A notable case in point relates to air-brake equipment. Of three locomotive builders, one chose to adopt 6-SL type equipment, and the others 24-RL type. Inevitably the attempt was made to operate two locomotives together with the different types of air-brake equipment.

It was accomplished by placing the 6-SL-equipped locomotive in the trailing position, the brakes operating only as car brakes—not independently.

The builder finally was induced to adopt 24-RL brakes, but as a costly alternative rather than as basic equipment. The difficulty already had extended to considerable proportions since a great number of locomotives had been placed in service with 6-SL equipment. These always will be a problem, unless isolated or changed to the more desirable 24-RL type. The cost of material per locomotive for making this change is $2500.

The writer feels that continued efforts toward standardization will result in great benefit eventually.

Comment by P. H. Hatch[5]

The term "standardization" as applied to diesel-electric locomotives probably should be construed more along the lines of interchangeability of parts than as exact duplication of parts. It is in this sense that it will be used here.

There are two kinds of standardization which apply to diesel-electric locomotives. One is the use of the same or closely similar parts in the various types of locomotive supplied by an individual builder, for example, the use of the same traction motor in passenger, freight, road-switching, and yard-switching locomotives of a given make. The other kind of standardization is the use of the same

[5] Transportation Division, General Electric Company, Erie, Pa.

or interchangeable parts in locomotives supplied by different builders.

It is to the latter that the author has called attention in a restrained and conservative fashion. As he says, it is not expected that manufacturers will standardize to the extent of loss of individuality or competitive position; but it certainly is reasonable to expect some degree of standardization in auxiliary and accessory parts. That there is a lack of such standardization is one of the inevitable but nonetheless unfortunate results of a rapid changeover in railroad motive power.

Rapid Changeover in Motive Power

Failure to standardize in these respects was more or less overlooked in the rush to dieselize. It caused some increase in inventory, it is true, and sometimes it caused locomotives to be held out of service longer than necessary. By and large, however, it seldom interfered seriously with operation and was considered more of a nuisance than anything else. Nevertheless, it carried a price tag, and in these days of high labor and material costs all price tags come in for attention. While the results cannot be measured accurately, there is no doubt that lack of standardization has increased diesel-electric - locomotive maintenance costs.

This is the situation today. What can be done about it?

First of all, on the part of the users there must be a demand for and an insistence upon a reasonable degree of standardization along the lines described for all new diesel-electric locomotives. The desired standardization will not happen by itself. Co-ordinating agencies must be established and a sincere effort made by all concerned to achieve results. It would seem, offhand, that the AAR and interested committees of the ASME, AIEE, and other groups offer ample means, technically and otherwise, to facilitate the necessary co-ordination.

Some Standardization Possible Now

As for present locomotives, the users and builders can get together on the best ways to modify them to certain standards as they undergo heavy repairs or rebuilding. Also, a certain amount of standardization can be accomplished on existing locomotives by means of minor changes. While both of these procedures will help, there is no denying that, in too great a degree, there is not much that can be done practically to improve the standardization picture on locomotives already built.

The author also calls attention to a different kind of standardization that is badly needed on diesel-electric locomotives today. This is standardized location and arrangement of control, indicating, and protective equipment on locomotives of different makes so that crews qualified on one make can operate another without a sense of strangeness and without having to trust to luck that nothing out of the ordinary happens. This, together with standardization of other locomotive equipment involving the crews, is a highly desirable objective.

This paper ably points to conditions needing improvement and will, it is hoped, be a step toward the co-ordinated effort required to improve standardization of diesel-electric locomotives.

Author's Closure

The author is indebted to the discussers of his paper for their helpful suggestions.

The author, too, is much concerned with how standardization can best be advanced. The problem is quite different than with freight cars as diesel locomotives are in interchange service in only isolated cases and the compulsion for interchangeability of parts does not exist so far as foreign roads are concerned. It is, therefore, difficult to put "teeth" into AAR designs.

We can see no reason why parts or arrangements of diesel locomotives should not be given the status of Standard or Alternate Standard in the AAR Manual. We believe such designs will be welcomed by the builders and carry weight. Letters from the Mechanical Division, AAR, to the builders calling specific attention to these designs would help a great deal. Implementation of these standards is up to the purchaser in the last anaylsis.

C. K. Steins.[6]

Russian Coal Mining

Comment by Gordon McVean[7]

The author is indeed to be commended for an interesting and thought-provoking paper.[8] It is timely to emphasize the basic position of the coal industry in the economy of this country. It has been said many times that 90 per cent of the reserves of raw materials for energy production in the United States is its bituminous coal. The theme of the recent meeting of the National Coal Association in Washington, D. C., "The Importance of Coal to the Nation's Economy," again emphasized the importance of a healthy and prosperous coal industry if our country is to be in position to meet threats of war and the demands of an ever-expanding economy. The need for more steel production and more power production can only mean increased coal production.

The figures relating to increased coal production in Soviet Russia are new to the writer and probably to most readers. The figures concerning production in the United Kingdom, France, Germany, Holland, and Belgium are more common knowledge.

Nationalized Mining

Doubtless, most of us have been impressed with the production figures of the nationalized mines in European countries and have drawn the conclusion that the inability to increase production to meet the demands generally has been due to inefficient government management and apathetic labor. That such need not be the case is certainly indicated by what has taken place in Soviet Russia.

The author points out the fact that there are few sizable mining-machinery manufacturers in Western Europe and that the nationalized coal industries, with some exceptions, have not encouraged the development of new cost-cutting equipment capable of functioning under the mining conditions prevalent in those countries. Undoubtedly, this is one of the major reasons why it has been possible in this country to make such rapid strides in increasing the productivity of our mines and to hold down mining costs in the face of ever-rising labor rates.

We do have highly competitive well-financed mining-machinery manufacturers who enjoy the confidence of the coal-mine operator. The more progressive operator has offered encouragement to the manufacturer and has been willing to co-operate in the development of better machinery because of the continuing competitive urge to lower costs. Such conditions not only are desirable but necessary in a free economy if we are to maintain our way of life.

Unprofitable Business

We are all completely conscious of the fact that the coal industry in our country has not been prosperous as general industry understands prosperity since the year 1948. This has been particularly true during the past 18 months when the country as a whole has reached new

[6] Mechanical Engineer, The Pennsylvania Railroad, Philadelphia, Pa. Fellow ASME.

[7] President, National Mine Service Company, Pittsburgh, Pa.

[8] "Coal Mining in the USSR," by J. D. A. Morrow, MECHANICAL ENGINEERING, vol. 76, February, 1954, pp. 166–169.

heights of industrial activity. If the trend toward reduced-profit margins (and losses in many cases) is not reversed in the near future, the investing public will lose confidence in the industry and the necessary capital required for continuing mechanization will not be forthcoming in the years ahead.

There is little likelihood that labor rates will decrease—in fact, the opposite appears more probable, and certainly competition from other energy sources will not permit of any drastic upward revisions in the selling prices of bituminous coal. The obvious answer is to find new and more economical mining methods and/or more efficient extractive machinery to be used in conjunction with present mining methods. There is urgent need for some new approaches to the problem and the delay in finding them cannot be too great if we are going to be in a position to meet the type of economic war the author forecasts.

European Methods

The writer has had occasion to visit Europe twice in the past two years. On these occasions he was afforded the opportunity to meet and talk with coal operators in England, Germany, and Holland, as well as to go underground in each country and observe prevailing conditions and attempts to mechanize production under those conditions.

If the average American coal operator could realize the natural handicaps under which coal is mined in the Western European countries, it is certain he would not be so prone to criticize the low level of output per man-day attained over there.

Longwall mining is generally practiced; room-and-pillar mining is almost nonexistent. For some years the writer labored under the impression that longwall mining was practiced abroad because the continental coal operator was not as smart as the American operator. Nothing could be further from the truth. The greater depth at which European mines must operate with consequent increase in roof and floor pressure makes it virtually impossible to drive rooms and entries of the width to which we are accustomed and keep them open. With longwall mining but two or three narrow panel entries need be driven for transportation and ventilation purposes and only 8 to 10 ft of roof immediately in front of the long face need be supported. In longwall mining, controlled fall of roof is desirable whereas in room and pillar, it is necessary to support the roof for the length of the rooms until complete pillar extraction takes place.

Longwall Mining

The reader may wonder why mention is made of longwall mining in discussing this paper. It is largely because the writer happens to believe that it has a place in our coal industry. Of course, many trials of the system have been made in this country and, until recently, with a few minor exceptions, none has been successful. The failures almost always have resulted from improper roof control and this, in the writer's opinion, has been caused by improper placement and movement of roof supports and use of props or jacks that were not designed properly to carry the roof load or to prevent penetration of the floor by the props.

The author refers to the fact that Russian production is dominantly by longwall methods and that considerable study and progress have been made with the mechanization of propping. If the removal of props and their placement according to a predetermined plan could be mechanized so that few men would be required across a face 600 to 800 ft long with the coal being cut, sheared, or ploughed by automatic machinery, and loaded onto heavy flexible conveyers, it should be possible to secure costs in some of our thin-seam mines that would equal today's costs in thick-seam mines where mobile loaders and shuttle cars have been employed so successfully.

Low-Volatile Reserves

It has been said that we have approximately only 20 years of reserves of low-volatile by-product coal left in this country. Practically all of it exists in thin seams in central Pennsylvania and southern West Virginia. Certainly we should think seriously of ways and means to lower production costs in these areas and increase the percentage of extraction we are obtaining. The majority of the mines operating in these seams are securing only 60 to70 per cent extraction. Longwall methods probably would increase that to 85 per cent.

The author certainly has made us conscious of the threat of increased coal production in Russia. It is almost trite to re-emphasize his sentiments that we need a strong coal industry and a healthy and live mining-machinery industry to work in conjunction with it if we are successfully to face the future problems of our country.

Reviews of Books

And Notes on Books Received in Engineering Societies Library

Kinematic Synthesis of Mechanisms

KINEMATISCHE GETRIEBESYNTHESE: Grundlagen einer quantitativen Getriebelehre ebener Getriebe (Kinematic Synthesis of Mechanisms: Foundations for a quantitative theory of plane mechanisms). By Rudolf Beyer. Springer-Verlag, Berlin, Germany, 1953. Cloth, 6 × 9 in., 258 figs., 217 pp., 36 DM.

Reviewed by A. E. Richard de Jonge[1]

IN this book, which addresses itself to the designer, college student, and to practicing engineers for private study, the well-known author has not only collected the information on quantitative kinematic synthesis, the so-called size-synthesis, which is widely scattered throughout the literature, but has also put it into an entirely new order, so as to make this treatise a unique one.

Starting from finite displacements and the relations revealed thereby, he treats the infinitesimally small displacements, which usually are the only ones considered, simply as special cases of the finite displacements. Thus he builds up an easily understood structure, which he uses both for explanation of kinematic analysis and its laws and for kinematic synthesis which is the principal object of this study.

Vector analysis is used to derive the laws of acceleration.

As far as the synthesis of mechanisms is concerned, he deals with the co-ordina-

[1] Mechanical Engineer and Consultant, Reeves Instrument Corporation, New York, N. Y. Mem. ASME.

tion of two positions of a member of a mechanism to be designed, with three finite and infinitesimally near positions, and with four finite positions of such a member, from which the mechanism which will bring the member into these positions, is derived. After some general considerations on the laws of co-ordination of positions of such members, he deals with five finite positions of a member and particularly with the Burmester points. Next, the laws and relationships of four and five infinitesimally near positions of a member are presented.

An extensive treatment of the hinged quadrangle is then given and extended to a number of variants and special cases of it. This is followed by the use of ellipses as osculatory curves instead of osculatory circles, thereby getting much closer osculation of curves.

A relatively new branch has been added by the author, namely, to realize given velocities and accelerations at certain points of the paths of a member. In this connection, use is made of the complex plane as a foundation for determining velocities and accelerations. Prescribed conditions of velocity and acceleration ratios and their application to the construction of mechanisms conclude the text.

The book, which in many respects is unique and the first that presents a comprehensive, yet concise, treatise of kinematic synthesis, should prove useful to designers and practicing engineers to guide them in their designs so as to do away, as far as possible, with the cumbersome and unreliable trial-and-error method. It can also be highly recommended to college students.

Books Received in Library...

ABSORPTION TOWERS. By G. A. Morris and J. Jackson. Butterworths Scientific Publications, London, England, 1953. 159 p., 10 × 6¼ in., bound. 36s. Simple types of laboratory-absorption equipment are considered first as a starting point for the design of full-scale packed towers. Special attention is paid to the transfer-unit method, to mechanical features of design, and to economic factors. Absorption involving chemical reactions is also treated, and a collection of calculations is included to illustrate applications of design methods. There are a glossary and a list of references.

ACTES DU COLLOQUE INTERNATIONAL DES VIBRATIONS NON LINEAIRES. France, Ministère de l'Air, Publications Scientifiques et Techniques, no. 281, Paris, France, 1953. 296 p., 10⅝ × 7⅛ in., paper. 1800 fr. Twenty-one papers are presented as given at a symposium on nonlinear vibrations. A wide range of topics is covered including theoretical dynamic considerations and practical problems such as crankshaft vibrations, radio-circuit oscillations, and various aspects of compressible flow in straight channels.

AIR CONDITIONING, REFRIGERATING DATA BOOK, 1953-1954. Design Volume. American Society of Refrigeration Engineers, New York, N. Y., eighth edition, 1953. Various paging, 9⅜ × 6½ in., bound. $7.50. A comprehensive coverage of refrigeration design, theory, thermodynamics, refrigerant properties, and related topics written by authorities in the various fields. There are new chapters on the heat pump, absorption and steam jet units, and abbreviations and symbols, and many chapters have been considerably revised. A buyers' guide is included.

ANNUAL REPORT ON THE PROGRESS OF RUBBER TECHNOLOGY. Volume 18, 1953. Edited by T. J. Drakeley. Published by W. Heffer & Sons, Ltd., Cambridge, for the Institution of the Rubber Industry, London, England, 1953. 173 p., 10 × 7¼ in., bound. £1, 1s. As in previous years, a general statistical and historical review is followed by surveys, written by specialists, of significant advances in the various fields. Essentially, the publication is a selective and critical summary of the literature in the field and also includes patents.

AUFWAND, LEISTUNG UND WIRTSCHAFTLICHKEIT NEUZEITLICHER WERKZEUGMASCHINEN. (6th Aachener Werkzeugmaschinenkolloquium 1953.) Verlag W. Girardet, Essen, 1953. 188 p., 12¼ × 9¼ in., bound. 36.00 DM. This collection of papers presented at a symposium covers present-day conceptions concerning the construction, application, and utilization of machine tools. Topics covered include reduction of tool-wear, temperature distribution at cutting edges, machining properties as related to structure, tool vibration, electrical controls, variable drives, and economic considerations.

DIESEL AND HIGH-COMPRESSION GAS ENGINES —FUNDAMENTALS. By Edgar J. Kates. American Technical Society, Chicago, Ill., 1954. 396 p., 8½ × 5¾ in., bound. $5.50. The aim in this book has been to treat the subject in nontechnical language without being superficial. It covers general features, basic physical and chemical terms, fuels, construction features, design of parts, engines of different types and makes, gas-burning engines, auxiliary systems, and operation and maintenance.

DIESEL ENGINE DESIGN. By T. D. Walshaw. George Newnes Ltd., London, England, second edition, 1953. 440 p., 8¾ × 5¾ in., bound. 35s. The main section of this book is devoted to methods and calculations for the design of engine components. Considerable attention is paid to valve-gear design, and there is material included on the dynamics of the connecting-rod crank mechanism and on torsional vibration and the balancing of crankshafts. Preliminary chapters cover thermodynamic and combustion principles, and engine types and sizes, while the final chapter provides sectional drawings of representative British and American engines.

FUNDAMENTALS OF THE WORKING OF METALS. By G. Sachs. Interscience Publishers, Inc., New York, N. Y., 1954. 158 p., 8¾ × 5½ in., bound. $4.75. This is an elementary discussion of the basic facts which determine the success or failure of forming operations. It covers effects of temperature and speed, chemical composition, and grain structure on forming, and describes the various methods of processing metals and alloys into simple shapes and of fabricating these into finished products. The material appeared previously as articles in *Modern Industrial Press*.

HEATING, VENTILATING, AIR CONDITIONING GUIDE. 1954. American Society of Heating and Ventilating Engineers, New York, N. Y., vol. 32, 1954. 1616 p., 9¼ × 6¼ in., bound. $10. Chapters on a wide range of topics are grouped under the following broad headings: fundamentals, human reactions, heating and cooling loads, combustion and consumption of fuels, systems and equipment, special systems, and instruments and codes. Important changes have been made throughout in accord with recent developments, and a chapter on residential summer air conditioning has been added.

INSTRUMENT MANUAL. United Trade Press Ltd., London, England, second edition, 1953. 628 p., 11 × 9 in., bound. £4.4.0. A review of British instrumentation covering a wide range of apparatus for observing, measuring, recording, and control. Various classes of instruments—ranging from engineering precision instruments to nucleonic instruments—are described in twenty-five sections, and there are lists of instrumentation organizations, publications, and manufacturers. A combined index is provided.

INSTRUMENTATION FOR THE PROCESS INDUSTRIES. PROCEEDINGS EIGHTH ANNUAL SYMPOSIUM. 1953. Conducted by School of Engineering, Texas Agricultural and Mechanical College. Instruments Publishing Company, Pittsburgh, Pa., 1953. 36 p., 11¼ × 8½ in., paper. $2. This symposium includes papers on the use of tubeless amplifiers, on sizing control valves, the use of field-test data for analysis, techniques of process monitoring, instrumentation of "packaged" gasoline plants, continuous control by infrared analyzer, and an evaluation of centralized control panels.

JAHRBUCH DER OBERFLACHENTECHNIK, 1954. Edited by W. Wiederholt. Metall-Verlag, Berlin, Germany, 1954. 735 p., 5⅞ × 4⅜ in., bound. 5.40 DM. This annual publication aims to present the latest information available in the technical and patent literature of Germany and other countries concerning the mechanical, chemical, and electrochemical treatment of metal surfaces. In addition to survey articles by specialists on various phases of metal-surface treatment, the book contains data tables, an extensive subject bibliography covering 1950–1953, and lists of trade journals, standards, and German equipment suppliers.

MAGNETIC COOLING. (Harvard Monographs in Applied Science, No. 4). By C. G. B. Garrett. John Wiley and Sons, Inc., New York, N. Y., 1954. 110 p., 8½ × 5¾ in., bound. $4.50. A monograph concerned with

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methods of attaining temperatures below 1 deg absolute and experiments on materials at such temperatures. Technical aspects of magnetic cooling, including the problem of determining absolute temperature, are treated first. Thermodynamic properties of the paramagnetic salts used in the process are next surveyed and consideration given to the quantum theory of parmagnetism and theories of low-temperature magnetic co-operative effects. Finally, there is a review of experiments at low temperatures on helium, on the superconductivity and resistance minimum of certain metals, and on nuclear alignment.

MANUAL FOR RAILWAY ENGINEERING. American Railway Engineering Association, Chicago, Ill., 1953. Various pagings. $9^3/_4 \times 7^1/_4$ in., loose leaf. $35. This is the 1953 reprinting of the complete manual of the Construction and Maintenance Section of the AREA, containing all the current specifications and recommended practices of the Section except those on the design of frogs, switches, crossings, etc., which are published in another volume. The manual includes a glossary of terms, and data on roadways, ties, track, structures, records and accounts, economics of location and operation, and other subjects. Annual loose-leaf supplements are also issued.

MATIER ENERGY MECHANICS. By Jakob Mandelker. Philosophical Library, New York, N. Y., 1954. 73 p., 9 × 6 in., bound. $3.75. The energy concept of matter, mc^2, is the basis of the mechanics in this work. The author introduces a new kinetic-energy formula which challenges the concept of kinetic energy as equal to the work performed and investigates the basic principles of mechanics from this new point of view.

METALLURGY OF WELDING. By Walter H. Bruckner. Pitman Publishing Corporation. New York, N. Y., 1954. 290 p., $9^1/_4 \times 6^1/_4$ in., bound. $6. As this text emphasizes the metallurgical aspects and problems of welding it should be of interest to the engineer and metallurgist. It first covers heat flow in metals, welding methods, and brazing. Other subjects covered are surface treatments; specifications for base metals, electrodes, and welding rods; weldability; and the economics of welding and design. References are listed after each chapter, and appendixes give a review of metallurgical principles and additional bibliography.

METALLISCHEN WERKSTOFFE DES MASCHINENBAUES. By E. Bickel. Springer-Verlag, Berlin, Germany, 1953. 442 p., 10 × $6^3/_4$ in., bound. 37.50 DM. A textbook for mechanical and electrical engineers giving basic information on ferrous and nonferrous metals and alloys, including data needed for the effective design and construction of machinery. It covers the structure and metallography of metals, the physical and chemical properties of metals and alloys, and their testing. Particular attention is paid to the problem of selecting the proper metal or alloy for any purpose.

MOLECULAR THEORY OF FLUIDS. By Herbert S. Green. Interscience Publishers, Inc., New York, N. Y., 1952. 264 p., $9^1/_4 \times 6^1/_4$ in., bound. $5.75. In this account of the general properties of fluids in terms of molecular structure, formal mathematical treatment of the subject is paralleled by a qualitative or semi-quantitative description in physical terms in order to make the book more widely usable. With emphasis on the liquid state, the book covers such aspects of the subject as the structure of fluids at rest and in motion, condensation and the liquid state, complex fluids and fluid mixtures, and the kinetic and quantum theories of fluids. There is a selected list of references.

POWER OF GAS. A Complete Manual on Oil Production by Gas Lift. By C. V. Kirkpatrick. Camco, Inc., Houston, Texas, 1953. 89 p., 11 × $8^1/_2$ in., paper. $5. An evaluation of gas-lift design problems and practices addressed to those without previous study in the field as well as to those with an advanced knowledge of the subject. In addition to the design and analysis of installations, gas-law, reservoir, and gas-measurement fundamentals and applications are treated.

RÉSISTANCE DES MATÉRIAUX. Volume I: Théorie de l'Élasticité et des Structures Élastiques. By Robert L'Hermite. Dunod, Paris, 1954. 860 p., $9^3/_4 \times 6^1/_2$ in., bound. 8400 fr. A comprehensive text on strength of materials which begins with a treatment of the theory of elasticity and certain major extensions; continues with internal equilibrium under tension, bending, and torsion and the analysis of isostatic structures, girders, and girder systems; and devotes the last half of the book to a thorough treatment of plates, slabs, and shells. Extensive chapter bibliographies are provided.

STATICS AND STRENGTH OF MATERIALS. By Roland H. Trathen. John Wiley & Sons, Inc., New York, N. Y., 1954. 506 p., $9^1/_4 \times 6$ in., bound. $7.50. While the coverage of this book is similar to that of existing texts, the arrangement of material differs in presenting statics and strength of materials as a unit. The primary emphasis is on principles, but throughout the text illustrative problems indicate methods of applying principles to the solution of engineering problems.

STATISTICAL THEORY OF EXTREME VALUES AND SOME PRACTICAL APPLICATIONS. (Applied Mathematics Series, no. 33.) National Bureau of Standards. Available from Superintendent of Documents, G.P.O. Washington 25, D. C., 1954. 51 p., $10^1/_4 \times 8$ in., paper. $0.40. The four papers included deal, in order, with practical problems to which the theory pertains; exceedances, return periods, and probability papers; exact and asymptotic distribution of extremes; and applications, including applications to aeronautics, to the breaking strength of materials, and a variety of problems. A bibliography is included.

SYMPOSIUM ON FRETTING CORROSION. (Special Technical Publication, no. 144.) American Society for Testing Materials, Philadelphia, Pa., 1953. 84 p., 9 × 6 in., paper. $2. Five papers, with discussion and references, are included in this report. The first is a general survey of fretting wear of metal surfaces, while succeeding papers cover experiments with different combinations of metals, methods of minimizing fretting corrosion, influence of fretting on the fatigue strength of fitted members, and the effects of lubricants on this type of corrosion. The last paper describes a test machine for the quantitative measurement of the phenomenon.

SYMPOSIUM ON INSULATING OILS. (Special Technical Publication, no. 152.) American Society for Testing Materials, Philadelphia, Pa., 1953. 45 p., 9 × 6 in., paper. $1.25. The fifth and latest symposium on insulating oils, held in 1952, was devoted to the single theme of reclaiming and inhibiting of used insulating oil. This report consists of a paper by Frank C. Doble and discussion on the paper. General treatment of the subject covering background, terminology, and a statement of problems, is followed by a description of modern maintenance methods, tests, means for reclaiming oil, effects of inhibition, and principles for a program for reclamation.

SYMPOSIUM ON PORCELAIN ENAMELS AND CERAMIC COATINGS AS ENGINEERING MATERIALS. (Special Technical Publication, no. 153.) American Society for Testing Materials, Philadelphia, Pa., 1953. 122 p., 9 × 6 in., paper. $2.50. Intended to give the practical engineer a better knowledge of the field of ceramic technology, these fifteen papers discuss the characteristics and properties of ceramic coatings; describe their application for increasing the resistance of metal surfaces to abrasion, corrosion, and vibration; and deal, in particular, with their use on high-temperature components such as for jet engines.

TABLES OF LAGRANGIAN COEFFICIENTS FOR SEXAGESIMAL INTERPOLATION. (Applied Mathmatics Series, no. 35.) National Bureau of Standards. Superintendent of Documents, Government Printing Office, Washington, D. C., 1954. 157 p., $10^1/_2 \times 8$ in., bound. $2. Lagrangian interpolation coefficients are tabulated for arguments expressed in angles (or time), in degrees (or hours), minutes, and seconds, for use in fields such as astronomy, ballistics, geodesy, and engineering. The four tables present, respectively, 3-point, 4-point, 5-point, and 6-point coefficients.

TECHNISCHE KOMPOSITIONSLEHRE. By Fritz Kesselring. Springer-Verlag, Berlin, Germany, 1954. 394 p., $9^1/_2 \times 6^1/_2$ in., bound. 39 DM. This volume deals with what might be called the "science of engineering creativeness." Intended for development and design engineers, the book presents the human, scientific, and economic interrelationship with which creative engineers should be familiar in addition to their purely technical knowledge; and in Part 2 covers the fundamental aspects of invention, design, and form from a practical standpoint.

TECHNISCHE MESSUNGEN. By A. Gramberg. Springer-Verlag, Berlin, Germany, seventh edition, 1953. 445 p., $9^1/_2 \times 6^1/_2$ in., bound. 36.00 DM. A concise review of methods of measurement for use in mechanical laboratories and in practical work. The properties of measuring instruments and methods of observing are first discussed, after which the construction and use of the customary instruments are described in detail. Measurements of pressure, time, velocity, weight, volume, temperature, etc., are considered, and there are chapters on calorimetry and gas analysis.

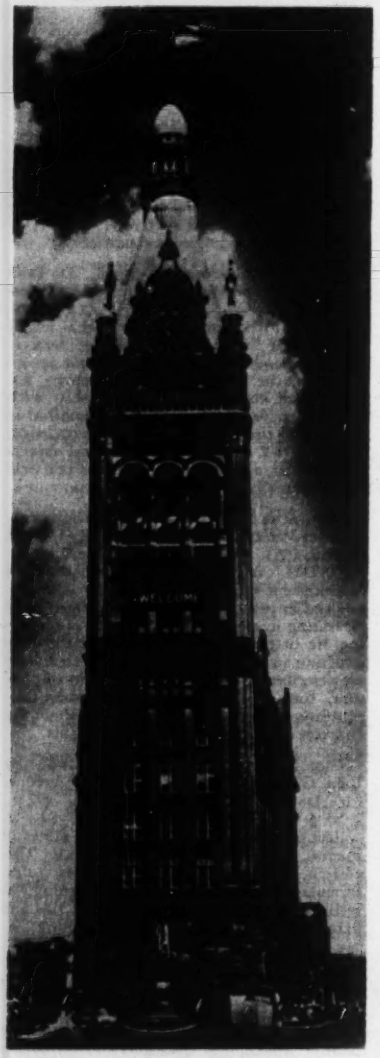
TOOL DESIGN AND TOOL ENGINEERING. By John G. Jergens, 18107 Invermere Avenue, Cleveland, Ohio, second edition, 1953. 492 p., 9 × 6 in., leatherette and plastic. $4. A collection of articles, drawings, and tables of interest to tool designers and engineers. This edition, greatly expanded, includes rules, formulas, and other data for designing, as well as many examples of details of jigs and fixtures, dies, and screw-machine tooling.

WORKSHOP COSTS AND COSTING. By P. S. Houghton. Chapman & Hall Ltd., London, England, 1953. 295 p., $8^3/_4 \times 5^3/_4$ in., bound. 35s. A practical guide to establishing an office of cost control within a manufacturing plant. Among the questions considered are price variation, checking waste, costing systems, indirect and normal expenses, wages, foundry costing, and contract and process costing. Separate chapters are devoted to methods of collecting data and the creation of a costing system.

ASME NEWS

With Notes on the Engineering Profession

1954 ASME Fall Meeting Offers Extensive Program at Milwaukee, Wis., Sept. 8–10



Milwaukee's City Hall, reflecting in its slender grace the old-world Gemütlichkeit for which the city is famous, extends the welcome of the city to all visitors. The City Hall, built in 1896, is industrial Milwaukee's tallest building.

Elaborate 50th Anniversary Celebration Plans of Milwaukee Section and Fall Meeting—Sure-Fire Double Header at the Home of the Braves

THE 1954 Fall Meeting of The American Society of Mechanical Engineers to be held at the Hotel Schroeder, Milwaukee, Wis., Sept. 8 through 10, will also mark the 50th Anniversary of the Milwaukee Section. This is the third national meeting of the Society to be held in Milwaukee.

Milwaukee and the Section

Milwaukee, once described as a valueless swamp, has become since 1846 the nation's 13th largest city and the home of manufacturing establishments which in one year produced industrial items valued at $2 billion. In the reflection of this industrial wonder the Milwaukee Section takes just pride in the contributions her illustrious sons have made to bring about this success. From the beginning, with 62 members, the rolls of the Section for the past fifty years carry names of men who have become legion in the profession, education, industry, and government. Edwin Reynolds, president ASME, 1901-1902, served on the local committee with Warren S. Johnson, Frank Kempsmith, Bruno V. Nordberg, and others. The officers were W. G. Starkweather and Martin A. Beck in 1904.

Many far-reaching suggestions for the improvement of Society operations have emanated from Milwaukee to further enhance membership in the Society. E. A. Uehling, until his death in 1953 at the age of 103, was the oldest member of ASME. This fact, however, was not his only claim to fame. His "made in Milwaukee" contributions to engineering have become internationally famous. Forrest Nagler, who had served as a vice-president, was a well-known authority in the field of turbines.

While ranking thirteenth in population, Milwaukee is the eighth largest industrial area in the country. Primarily a heavy industrial community, there is enough diversification in the economy to maintain healthy conditions even when business is slack in other areas.

Manufacturing establishments in Milwaukee County produced industrial items valued at $2 billion in 1952. The leading industrial classifications represented in this production are: Engines and turbines, automotive equipment and assembly components, electrical control apparatus, construction and mining machinery, iron and steel foundries, malt liquors, metalworking machinery, structural metal products, and electric motors and generators. Milwaukee County is the nation's third largest consumer of steel.

Milwaukee leads the world in the manufacture of diesel and gasoline engines, outboard motors and motorcycles, tractors, wheelbarrows, padlocks, and beer. Milwaukee is the biggest veal-packing center, the greatest barley market, and the location of four of the nine largest breweries in America. Milwaukee leads the nation in the production of hosiery, work shoes, leather gloves and mittens, tin and enamel ware, saw and flour-mill equipment and is one of the country's leading graphic-arts centers.

Since the end of World War II the Association of Commerce has been active in encouraging the development of new industry in Milwaukee. The largest additions to the community economy have been American Can Company, Continental Can Company, AC Spark Plug Division of General Motors Corporation, Hotpoint Incorporated, and General Electric X-Ray Corporation. These five installations represent an investment of nearly $40 million and account for an annual pay roll of approximately $25 million to 10,000 employees.

The start of over 300 new industrial concerns has contributed to the over-all increase in Milwaukee's potential since 1945. Virtually every manufacturer in the area has undertaken extensive expansion and additions. The breweries for which Milwaukee is so famous have expanded their facilities at an estimated cost of $100 million.

Although far removed from the ocean, Milwaukee is one of the leading ports of the nation. It ranks second among all Great Lakes ports in coal receipts, is one of the four prin-

View of Milwaukee shows city's lake front and the adjoining Juneau Park. In the background, along Milwaukee's Civic Center, are located the City Hall, Arena, Auditorium, Safety Building, Court House, Library, and Museum—these and more attract year-round visitors. See them all during the 1954 ASME Fall Meeting to be held at the Hotel Schroeder, Sept. 8–10.

cipal grain-shipping ports, and is a leading package-freight port. It handles a large volume of import and export trade and has regular scheduled steamer service. The port of Milwaukee is served by eight lines of modern ocean vessels linking Milwaukee with the larger ports of Europe, the Mediterranean, and the Caribbean.

Local cultural interests are served by one of the nation's largest publicly owned natural-history museums—with a magnificent collection of more than 632,000 specimens of historical and scientific curios (including the largest collection of Indian artifacts in the world); a public-library system—central library and 18 branches—with more than 1,200,000 volumes; and two art galleries.

Milwaukee Ideal for Meeting and Vacation

Milwaukee with its many recreational facilities offers an ideal opportunity to combine a vacation with attendance at the Fall Meeting. Within the city limits is a beautiful park system and there are numerous bathing beaches. Tennis, golf, baseball, and other sports are adequately served through public facilities. In addition, there are 163 inland lakes within an hour's drive of the city, affording unusually fine fishing, swimming, and boating.

Technical Sessions

As is typical of Milwaukee, the Meeting will not all be reflection of the past, but an evaluation of the present and long look toward the future. Fourteen of the Professional Divisions, namely, Fuels, Metals Engineering, Materials Handling, Machine Design, Product Engineering, Heat Transfer, Power, Hydraulics, Metals Processing, Railroad, Gas Turbine, Management, and Education, will hold sessions to report the latest information in their respective fields. There will also be a National Juniors' conference and a Lubrication Activity report.

Social Program

As the social program begins to take shape,

Enjoying trout fishing in Wolf River

a few of the features include a Golden Anniversary Gay '90's Party to be held Tuesday evening at the Engineering Society of Milwaukee, where the entertainment will be old-timer movies, square dancing, and so on.

The banquet features Melvin J. Evans, Mem. ASME, as speaker of the evening. He will talk about people in industry. W. J. Grady, past-president, NAM, and president of Grady Foundries of Milwaukee, will serve as toastmaster.

"Gemütlichkeit"—if you do not know what this means, an excellent opportunity to learn is made available to gemütlich students at Blatz Brewery on Wednesday evening.

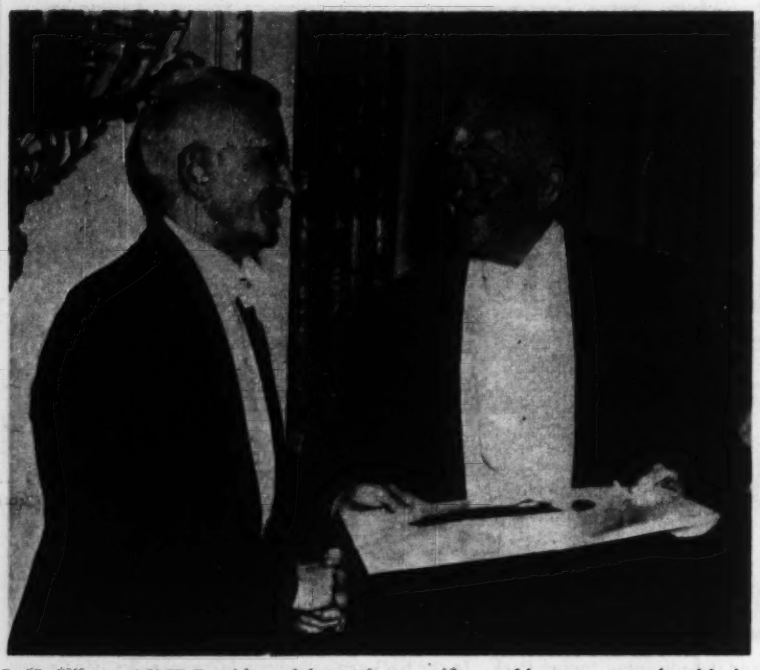
Women's Program

The women are, of course, welcome to all the social events of the meeting; and special arrangements to date list a luncheon at the Chalet on the Lake. While the food is superb, the pièce de résistance here will be chapeaux made before very delighted eyes by a famous milliner. A tea and tour of the Allis Art Library is planned and Friday will be devoted to various hostess activities.

Inspection Trips

The list of plant and inspection trips is not complete. So far, trips to the Oak Creek Power Plant of the Wisconsin Electric Power Company, Allis-Chalmers Manufacturing Company, Kearney-Trecker Corporation, and Chain Belt Company are scheduled.

Weather permitting, the Braves will also be in session!



L. K. Sillcox, ASME President, *left*, receives certificate of honorary membership in The Engineering Institute of Canada at the Institute's 68th Annual Banquet, May 14, Chateau Frontenac, Quebec. R. L. Dobbin, EIC President, makes presentation.

ASME Jubilee Plans Pivot on The Engineer and the World Around Him

1955 Marks 75th Anniversary of ASME

PLANS have been completed for a series of major events to be conducted in 1955 in connection with the observance of the 75th Anniversary Year of The American Society of Mechanical Engineers, according to an announcement by C. E. Davies, secretary ASME.

The Society will hold five major national meetings during the course of the year. Two of the meetings will commemorate dates important in the planning and founding of ASME. Three will be held at times normally assigned to national meetings of the group.

Theme matter for the year's celebrations will center around discussion of the engineer's place in our world. According to Jess H. Davis, president, Stevens Institute of Technology, who is chairman of ASME's 75th Anniversary Committee, the areas of inquiry will concern "the engineer and his relationship with the world in which he lives and works: Not just the mechanical engineer—and not just his contributions to his fellow man—but all engineers, and the entire pattern of relationships between engineers and the rest of the world."

Outline for Jubilee Year

The first major affair of the Jubilee Year will be held on February 16, anniversary date of the founding of ASME. A commemorative ceremony will take place in the offices of McGraw-Hill Publishing Company, Inc., New York, N. Y.

It was in the offices of the McGraw-Hill publication, *American Machinist*, that three men first met to lay plans for the organization of the Society. They were John Edson Sweet, professor of practical mechanics at Cornell University; Alexander Lyman Holley, who was instrumental in bringing the Bessemer process of manufacturing steel to this country; and Robert Henry Thurston, professor of mechanical engineering at Stevens Institute of Technology.

The first meeting in 1955 will be developed around the theme—"The Engineer and His Communications." After the morning meeting a panel discussion on communications is planned to be held in the auditorium of the Engineering Societies Building, with participants from newspapers, magazines, the technical press, radio, and other media. This is to be followed by an All-Engineers Banquet, featuring a major address on the subject of communications.

Second meeting of the year will be held on April 16 on the campus of Stevens Tech, Hoboken, N. J. The theme will be "The Engineer and the World of Education." Panelists and speakers will be persons prominent in the field of education. This one-day meeting will commemorate the first organization meeting of ASME, also held at Stevens, at which Professor Thurston was elected first president of the Society.

The three national meetings in 1955 will each have two panels and a banquet speech devoted to the theme subject.

A meeting in Baltimore, Md., April 18–21, will center around discussion of the engineer and the world of government.

The engineer and the world of science will be the theme of a meeting to be held in Boston, Mass., June 20–23. One of the two panels will discuss the engineer and his fellow scientist, with emphasis on the interrelationship between engineering and the physical, social, and biological sciences. The other panel will concern itself with a discussion of the engineer and the scientific future.

The fifth national meeting ASME's Jubilee Year will take place in Chicago, Ill., November 13–18, and will be devoted to discussion of the engineer and the world of commerce and industry.

General Chairmen for Meetings

General chairmen for the meetings are: Founding Meeting, Burnham Finney, editor, *American Machinist;* Organization Meeting, James H. Potter, head, mechanical-engineering department, Stevens Institute of Technology; Baltimore Meeting, Arthur Gompf, Egli & Gompf, Inc.; Boston Meeting, Alfred J. Ferretti, professor of mechanical engineering, Northeastern University; Chicago Meeting, James D. Cunningham, president, Republic Flow Meters Company, and Alex D. Bailey, retired vice-president, Commonwealth Edison Company, co-chairman.

Members of the 75th Anniversary Committee, in addition to Dr. Davis, are T. A. Marshall, Jr., secretary to the committee and director of public relations, ASME; R. B. Smith, vice-president, M. W. Kellogg Company; A. C. Pasini, assistant general superintendent of production, production department, Detroit Edison Company; Otto de Lorenzi, director of education, Combustion Engineering, Inc.; and Eugene W. Jacobson, chief design engineer, Gulf Research & Development Company.

21st National Power Show Moves to Philadelphia

ANNOUNCEMENT has been made that the 21st National Exposition of Power and Mechanical Engineering will be held at the Commercial Museum in Philadelphia, Pa., Dec. 2 to 7. Transfer of the Power Show to Philadelphia was determined by a vote of exhibitors when Grand Central Palace in New York, N. Y., where it has been held heretofore, was rented by the Government. As in recent years, the exposition will be held under the auspices of The American Society of Mechanical Engineers, whose Annual Meeting is scheduled in New York, Nov. 28 to Dec. 3. For this reason the exposition was jointly planned to open on Thursday, during the week of the Meeting, and continue through Tuesday of the week following, except Sunday, when it will be closed. Arrangements for the show are under the management of the International

Exposition Company of New York, with Charles F. Roth as manager and E. K. Stevens, associate manager. Space has already been reserved by over 200 exhibitors.

Dickinson Memorial Lecture and Medal

THE first biennial Dickinson Memorial Lecture to the Newcomen Society for the study of the history of engineering and technology was delivered by Charles Singer on May 12, in the Science Museum, South Kensington, London, England. The chair was taken by Rex Wailes, MIME, FSA, president of the Society. The lecture has been established, in collaboration with the North American affiliated Newcomen Society, to commemorate the long association with the society, and the valuable work, of Henry Winram Dickinson, MIME, who was a founder member of the newcomen socsety, president in 1932–1934, honorary secretary for more than 30 years, and editor of the first 25 volumes of the Transactions.

Dr. Singer, who had been a close personal friend of Dr. Dickinson for many years and had been associated with him in many historical researches, said that if his lecture required a title, he would like to call it "The Happy Scholar," for that most aptly described Dickinson's character and life. Simplicity, and the dignity and magnanimity that stemmed from it, were among the marks of scholarly greatness and Dickinson had them in full measure.

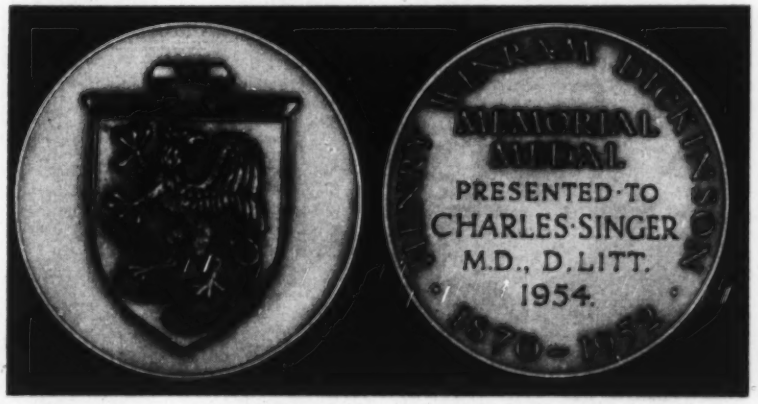
The most significant events of Dickinson's official career, continued Dr. Singer, were the acquisition and arrangement of some of the more important historical exhibits at the Museum, among them the early Watt engines and James Watt's garret workshop, which was transferred complete from Watt's house near Birmingham. The life and work of Watt became Dickinson's close study and was the subject of more than one of his books; but Watt also influenced his career in another way, for it was as a result of the commemoration, in 1919, of the centenary of Watt's death that the Newcomen Society was founded in 1920. Thus it came about that the main achievement of Dickinson's life was compressed into the last 30 years of it.

"We are sometimes warned," said Dr. Singer, "that the age constitution of our population is rapidly rising, so that the proportion of so-called 'active workers' necessarily falls. But surely there is another side to this. In all matters demanding experience, and notably in scholarship, there is, within limits, a positive correlation between age and effective performance. Very few great works of learning have been produced by men under 50. In this respect they differ entirely from inventions. The faculty of invention matures much earlier and seems to be most active between 20 and 40. Certainly, had Dickinson died before he was 60, his achievement would have been very inferior to what it was. But as it is I have no doubt that the publications of the Newcomen Society up to 1952 will be regarded, for many generations, as the foundation of a new discipline and as a first sign of the broadening of technical education."

On the conclusion of the lecture, the President handed to Dr. Singer the commemorative Dickinson Medal which is illustrated on this page. It is two inches in diameter, of oxidized bronze, and bears on the obverse the Newcomen Society's badge of a gryphon segreant with the motto, due to the late Colonel E. Kitson Clark, *Actorum memores simul affectamus agenda*, which may be freely translated as "Remembering the deeds of the past we strive after those still to be done."

ASME Membership as of May 31, 1954

Honorary Members	51
Fellows	391
Members	14,077
Affiliates	320
Associate Members (33 and over)	3,569
Associate Members (30–32)	3,139
Associate Members (to the age of 29)	16,676
Total	38,223



Obverse and reverse of the medal which was presented to Dr. Singer after he had delivered the first Dickinson Memorial Lecture, May 12, in the Science Museum

ASME Survey Questionnaire Mailed to Members in July

Prompt Return Urgent

ABOUT the time the July issue of MECHANICAL ENGINEERING is in the mails, members of The American Society of Mechanical Engineers will receive the "ASME Survey Questionnaire." Be on the lookout for it.

Prompt return of the questionnaire, thoughtfully executed, will provide statistical material on which ASME Boards and Committees can improve their programs of activities and services to members.

It should not require many minutes to answer the questions by check marks.

Read the Entire Questionnaire Before Checking Answers

It is important to read the entire questionnaire before answering any of the questions. This preliminary study is particularly important in respect to questions 2, 3, and 4. Tabulation of the replies to these questions will make it possible to classify members by the industry or business with which they are connected, the major activity or function of each member's occupation, and the field of specialization in which each member's work lies. Once the significance of each of these three questions is grasped, choice of the items to be checked should be clear. Particularly in respect to question 2, the entire list of industries or businesses should be reviewed carefully before checking the one which most closely fits an individual's case.

Results of Questionnaire Should Show How to Improve Member Service

The questionnaire is arranged so that the information can be transferred to IBM punch cards. From analysis of these cards it will be possible:

1 To improve the organization of the Professional Divisions.

2 To study the possibility of grouping papers of related Divisions in a number of sections of Transactions.

3 To improve the planning of programs for National Meetings, Division Conferences, and Section meetings.

4 To improve MECHANICAL ENGINEERING as a result of opinions and preferences of a majority of members.

The Survey Questionnaire is an important step in providing better service to members. Prompt return by every member of the Society is essential.

Hydraulics Forum Discusses Increased Water Demand

THE role of research, and the need for further education in the technical fields, were highlighted recently at a forum on the problems arising from increasing water demands in the United States.

Francis M. Dawson, Mem. ASME, was chairman of the technical forum held in connection with the opening of the new Fairbanks, Morse & Company pump works in Kansas City, Kan. (see pp. 595-597 of this issue). Dr. Dawson noted that Russia, although generally considered to be well behind the United States in general education, is educating twice as many technical people as is this country.

Dr. Dawson, dean of the college of engineering, State University of Iowa, pointed out that while the education received in the technical fields in Russia may not be as complete as that possible in the United States, emphasis is being placed on having a large group capable of conducting research vital to both peaceful and nonpeaceful activities.

Role of Research in Hydraulics

Following the same thought, Richard G. Folsom, Mem. ASME, Director of Engineering Research Institute, and professor of mechanical engineering, University of Michigan, said that the stock pile of ideas in the United States is dangerously low. Speaking particularly of the problems facing the forum, Dr. Folsom said that there were four important facts to remember: (1) Hydraulic engineering and, in particular, centrifugal pumps have an important future, (2) research has a large and important role in that future, (3) success in research depends primarily on men, and (4) success of men in research depends upon close co-operation of industrial companies and educational institutions.

Dr. Folsom added further that research, contrary to general opinion, is not for the scientist alone; it is for anyone capable and interested.

"Actually," he said, "the scientist has the easiest job, since he is able to pick the subject he is interested in, knows that it is susceptible of solution, and can confine himself to any portion of the problem. The engineer, on the other hand, is given a problem that demands an answer whether it seems possible or not."

Centrifugal-Pump-Problems Panel

A panel session of the forum, under the moderation of Robert T. Knapp, Mem. ASME, professor of hydraulic engineering, California Institute of Technology, discussed what has happened in the field of centrifugal pumps in the past 25 years and what the future holds in store.

Discussing the over-all future of the centrifugal-pump business, Clement P. Lindner, chief engineer, South Atlantic Division, Corps of Engineers, Department of the Army, said during the panel that the ever-present demand is for bigger and more efficient pumps. "The demand," he said, "will force manufacturers to produce pumps much larger than those of today. The increase in population of this country makes it increasingly necessary to utilize all of our available resources in the most economical fashion possible, and in order to make the best use of our resources it will be necessary to reclaim and develop the large amount of land which is now not producing."

Water Demands Increasing

Speaking at a luncheon following the forum session, Gail A. Hathaway, past-president of the American Society of Civil Engineers and now special assistant to the Chief of Engineers on flood control, river-and-harbor project planning and construction planning, said that the per capita use of water in the United States has quadrupled since 1900.

"From 1900 to 1950 the population had doubled and the use had grown from 500 to 600 gpd per capita to 1100 gpd," he said. "The total withdrawal in 1950 of fresh water was 170 billion gpd, or one eighth of the total yield of the nation's streams and aquifers.

"In 1950 direct withdrawal by industrial firms was 65 billion gpd of fresh water and 15 billion gpd from brackish or salty sources. . . . . (but) the biggest user by far of fresh water is irrigation. In 1950, 26 million acres of irrigated land received about 50 per cent of fresh water withdrawn in the United States. Estimated irrigation accounts for over 80 per cent of the total consumption depletion of all water uses. Although confined mostly to the West in the past, now land is being subjected to supplemental irrigation to increase crop yields in the East.

"Around 18 per cent of withdrawals of fresh water for irrigation was obtained from wells (mostly pumped) and in California alone the gross total pumpage in 1950 was 10 million acre feet, or about 40 per cent of the total pumpage in the United States."

Speaking of the future, Mr. Hathaway said that "with the constantly rising standard of living and the increasing per capita consumption of raw materials we may expect the demand for the nation's water supply to be doubled again from 1950 to 1975. In fact, water supply may be the most important factor affecting industrial location.

"It must be recognized that the narrowing margin between the present water supply and the amount ultimately available is going to require more knowledge, better engineering, and increased consideration of complicating factors on the part of water users."

Investment Casting Institute Held Industry-Wide Meeting

WITH more than a year of organizational planning behind them, the Investment Casting Institute launched its first industry-wide meeting on May 6 at the Hotel Carter, Cleveland, Ohio. More than 30 companies make up the Institute which, for purposes of standardization, defines investment casting as the production of industrial metal castings made with expendable patterns and monolithic molds.

The first industry-wide meeting was highlighted by talks by leading authorities in the investment-casting field. Nicholas J. Grant, associate professor of metallurgy, Massachusetts Institute of Technology, spoke on "Mold and Metal Temperatures and Their Effect on Casting Quality"; James Coley, sales manager of Ajax Electrothermic Corporation, discussed "Induction Melting, Theory and Practice"; Roger W. Waindle, president, Wai Met Engineering Company, covered the subject "Specific Problems in Alloy Casting."

The afternoon session heard Frank C. Howard, chairman of the board of Howard Foundries, Inc., speak on "Opportunities Unlimited"; W. I. Matthes, executive vice-president of Arwood Precision Casting Corporation, advised the group on "Selling the Industrial Market," while Ted Operhall, vice-president of Misco Precision Casting Company, covered "Selling the Defense Industry." V. S. Lazzara, president of Casting

Nicholas J. Grant discusses "Mold and Metal Temperatures and Their Effect on Casting Quality" at the Investment Casting Institute

Engineers, Inc., acted as moderator of a round-table discussion.

Among the long-range objectives of the Institute are (1) the standardization of nomenclature, specifications and testing procedures within the industry; (2) establishment of the Institute's role on behalf of the industry in relations with the government, and conversely, the circulating of the membership with bulletins clarifying government policies pertinent to the industry; (3) the collecting and publishing of statistics and other useful information for membership consumption; (4) the providing of a forum for the voluntary exchange of technical information and problems within the industry, and the establishing of a liaison between manufacturers, vendors, and technical societies associated with investment castings, to promote better working conditions and higher efficiencies; (5) the acceleration of the growth of the industry by study and publication of the features and advantages of investment casting.

Tentative plans have been made for the Institute's annual meeting to be held in New York, N. Y., Nov. 4 and 5.

Council of Engineering Society Secretaries and guests who attended the annual meeting, held at The Engineering Society of Detroit (Mich.), May 20 and 21

ASME Textile Engineering Division Held Meeting in Boston

A ONE-DAY conference was held by the Textile Engineering Division of The American Society of Mechanical Engineers in the Sheraton Plaza Hotel, Boston, Mass., on Friday, May 21.

D. P. Campbell speaks at the Textile. Engineering Luncheon

The morning was devoted to registration and a session to discuss two papers concerned with matching electrical characteristics of motors in textile-drive requirements. One paper covered the direct-current motor by Fred D. Snyder and the other the alternating-current motor by R. E. Parker.

A special luncheon was served at which D. P. Campbell, associate professor of electrical engineering at The Massachusetts Institute of Technology, gave an interesting talk on handling of materials (composition) by automatic controls.

The afternoon session consisted of two papers, one by R. H. Brown, about electric-motion control of textile machinery and the other by R. O. Palmer, about an electric multiple-plate clutch. Unfortunately, no preprints of these papers are available.

Council of Engineering Society Secretaries Met in Detroit

THE Council of Engineering Society Secretaries—representing 33 societies—met at The Engineering Society of Detroit (Mich.) May 20-21, 1954, to attend the Council's annual meeting.

In addition to the secretaries of national, state, and local societies and clubs were staff members and guests who assembled to discuss such important topics as publication policies and methods, facilities of headquarters, office administration, membership, intersociety relations, and other pertinent questions and problems which arise in the management of a society. The program was conducted in panel discussions under each of six groups of related topics. Each panel was composed of five members who also answered questions directed to them from the floor.

At the banquet the featured speaker was L. E. Brownell, director, Fission Products Laboratory, University of Michigan. He gave an interesting illustrated address on the subject: "Atomic Preservation of Food." Through colored slides he showed the remarkable progress which has been made to date in the preservation of both meats and vegetables through the radiation process.

During the course of the meeting the secretaries visited the new building owned and operated by the American Society of Tool Engineers, which has many unusual features. A visit was also made to the building of the Engineering Society of Detroit which is probably the most beautiful and completely equipped building of any engineering society in the country.

The Council officers elected for 1954-1955 include: Edward H. Robie, president; J. Earl Harrington, vice-president; M. C. Turpin, secretary; and Charles S. Doerr, treasurer. The retiring president, Ernest Hartford, was elected as a director. The next meeting will be held at Philadelphia as guest of the Philadelphia Engineers Club on Tuesday and Wednesday, May 24-25, 1955.

Coming Meetings . .

Quality Control

THE first annual Western regional conference of the American Society for Quality Control, in conjunction with the National Conference of the Aircraft Technical Committee, will take place at the U. S. Grant Hotel in San Diego, Calif., on Aug. 9 and 10.

Working around the theme "Investment Dividends From Modern Quality-Control Methods," the program will feature speakers who will present factual evidence of "dividends" realized or which may be expected to be realized through specific, modern quality-control methods.

Instruments

AN invitation to attend the First International Instrument Congress and Exposition at Philadelphia, Pa., Sept. 13-24, 1954, was extended to scientists and engineers of 32 foreign countries by William A. Wildhack, president, Instrument Society of America, at a special luncheon recently held in the Federal Room of the Statler Hotel, Washington, D. C.

Representatives from the foreign embassies and the United States Government were given an outline of the plans made to date and were advised that consolidated exhibits have been arranged for by England, France, Germany, Japan, Sweden, and Switzerland.

Richard Rimbach, Mem. ASME, managing director of the Congress and Exposition, announced that members of the Society who desire to send individual invitations to foreign countries, which have been printed in French, German, Portuguese, and Spanish, may have copies for their use.

Flow demonstration viewed by visitors during the OSU engineers conference.

OSU Annual Conference Held for Engineers

Admiral Rickover and C. E Kettering address the Conference

More than 600 alumni, faculty, students, and guests attended the first annual Conference for Engineers at The Ohio State University on May 7. Admiral Hyman G. Rickover addressed the luncheon gathering at noon and Charles F. Kettering addressed the general morning session. The afternoon was devoted to technical meetings in the departments of the college of engineering and inspection of the laboratories and the numerous research programs under way.

Nuclear Engineering

Admiral Rickover, who is largely responsible for the atomic-powered submarine, spoke on "Nuclear Engineering and Engineering Education." After describing some of the main problems in atomic power such as materials, metallurgy, shielding, and electronic controls, he stated that our most important problem today is the education of competent engineers. Education is more important than any other problem, including the H-bomb.

Russia is winning the battle of training more engineers and attainment of supremacy in the engineering field. The countries in the free world are looking to us for leadership and we should provide it. He stated that atomic energy is 95 per cent engineering and only 5 per cent physics, contrary to the popular conception that it is mostly physics. Mechanical, metallurgical, electrical, and chemical engineers plus physicists and chemists comprise the main personnel needed in the development of atomic power.

There is a shortage of 60,000 engineers in the United States and this shortage will exist for a long time. Admiral Rickover pointed out some of the deficiencies in present teaching to engineers. He stressed the need for thorough grounding in the fundamentals of chemistry, physics, metallurgy, and mechanics. Communities and parents should shoulder some of the responsibility for better education. Many potential scientists and engineers enter other fields and careers. Raising the standards of teaching by increasing salaries was also proposed.

Admiral Rickover's closing words were "Fortune favors the prepared mind."

Engineering Research

Dr. Kettering, Fellow ASME, famous inventor and engineer, spoke on "Getting Results From Engineering Research." He deplored the viewpoints of many people with preconceived ideas. We should look on "both sides of a formula" and not hesitate to try something if the textbooks say it can't be done. He stated that opportunities today were greater than ever before.

Meetings and open house were held in the the afternoon by the various engineering departments. All these meetings were well attended and successful.

Dean Gordon B. Carson stated that one of the purposes of the Annual Conference for Engineers is to point out the relationship between the activities of the College of Engineering and the existing industries in Ohio in order to attain greater mutual co-operation. The college can serve industry through research and developments in engineering established by its programs.

Noise-Reduction Engineering

In connection with the preparation of a "Handbook of Noise-Reduction Engineering" to be published by the McGraw-Hill Book Company, Inc., this inquiry is directed to industrial firms having noise studies in their plants or noise analyses of their products, either in various stages of design or in production testing. The new handbook, which covers all phases of noise, its control, and effects on man, places special emphasis on noise problems in industry and their solutions. Any suitable data should be sent directly to the editor, Prof. Cyril M. Harris, Acoustics Laboratory, Columbia University, 632 West 125th Street, New York 27, N. Y., together with a statement indicating how such data are to be credited.

Joint Committee of the Design Professions—Pamphlets Available

"Division of Responsibility Among the Design Professions," a guide for collaboration, prepared by the Executive Committee of the Joint Committee of the Design Professions, is now available.

The pamphlet in an introduction outlines the activities and responsibilities of the Committee. The chapter on collaboration contains a statement of principles, co-ordination of work, contracts, and definitions. In the part on buildings the division of responsibilities and work among the professions is discussed under the following headings: Housing, institutions (educational, medical, and custodial); and Governmental buildings (administrative and functional).

S. Logan Kerr, Fellow ASME, represents the Society on the Executive Committee.

Copies of the pamphlet may be obtained upon requests from The American Society of Mechanical Engineers, 29 West 39th Street, New York 18, N. Y.

Rich Computer Center at Georgia Tech

The $340,000 Rich Electronic Computer Center will be established at the Georgia Institute of Technology, Atlanta, Ga.

The first such center at any Southern educational institution has been made possible by grants from the Rich Foundation of Atlanta and the Georgia Tech Research Institute. A $170,000.00 building to house the center is being provided through the University System Building Authority of Georgia.

The plans include a two-story building next to the present Research Building. Due to the great demand for the services of an electronic digital high-speed computer by the research activities of the Institute and by industry and business of the Southeast, a medium-sized, general-purpose computer will be purchased and put into operation as soon as possible in temporary space to be provided by the Georgia Tech Engineering Experiment Station.

Then, with the aid of the computer and engineering and scientific personnel of Georgia Tech and the Station, it is planned to design and construct a larger and more powerful computer similar in size and operation to those

at Harvard and The University of Pennsylvania. Being "Made in Georgia," it will be a monument to the technical and industrial progress made in the state in the past decade.

The services of the two computers will be made available to Southeastern industry and business through the Georgia Tech Research Institute. The actual operation will be under the direction of the Georgia Tech Engineering Experiment Station assisted by personnel of the school of mathematics.

At Georgia Tech, the two computers will be used in the research activities of the Institute as well as for the training and education of students in this new field.

For the past eight years Georgia Tech has been rendering a special type of computing service to the electric-power industry of the country through its A.C. Network Analyzer, an analog type of computer obtained through a grant of $125,000 from the Georgia Power Co. From the calculations made on this machine, there have been designed and constructed millions of dollars of new electrical generating stations and power lines throughout the Southeast and the rest of the United States.

Michigan State College Centennial

A YEAR-LONG observance of world-wide significance will bring leading world figures and international attention to Michigan State College in 1955, the year of its 100th anniversary.

Now America's ninth largest university, Michigan State was founded in 1855 as the country's first agricultural college and the model for the U. S. land-grant college system.

In all, more than 25 major Centennial events—from academic symposiums to "world's-fair" shows of technological progress—are on the 1955 calendar.

Opening the observance formally will be Founders' Day on Feb. 12, 1955. It was on this date in 1855 that the act was signed which established Michigan State College. It also is the birthday of President Abraham Lincoln, who in 1862 signed the Morrill Act, creating the national system of land-grant colleges and universities on the Michigan State College pattern.

Ten academic symposiums during the Centennial year will be attended by scholars and scientists from all over the world. Leading authorities will discuss issues and conditions in many fields, including agriculture, education, engineering, communications, science, arts, and others. Among the topics of wide interest will be "Administering Human Affairs, 1955–2000," "Nutrition of Plants, Animals, and Man," and "The New View of Man —A Synthesis and Forecast."

Major events also will include: The Industrial Exposition, May 11–14, bringing together in a world's-fair setting hundreds of exhibits from the nation's business and industrial corporations.

The Centennial of Farm Mechanization, Aug. 16–20, traces the development of farm equipment since 1855 but focuses attention on the present and future with a huge show of displays and demonstrations.

The Fall Convocation, during the week of October 10, is to be addressed by an outstanding world figure.

Selected as a theme for the Centennial year is a quotation from Lincoln's Gettysburg address which reflects the nature and purpose of the entire Centennial observance: "It is for us the living . . . to be dedicated here to the unfinished work."

Guiding the Centennial-year planning is a committee of eight faculty members appointed six years ago. More than 400 other faculty members and students are serving on 32 subcommittees to carry out details of the many individual programs.

Engineers Plan Important Meetings in Brazil

PLANS are now being completed for the international engineering meetings to be held in Rio de Janeiro and Sao Paulo, Brazil, between July 25 and August 12, 1954.

These meetings are: Sectional meeting of World Power Conference in Rio de Janeiro, July 25–Aug. 10; fourth convention of Inter-American Association of Sanitary Engineering (AIDIS) in Sao Paulo, July 25–31; and third convention of Pan-American Federation of Engineering Societies (UPADI) in Sao Paulo August 2–12.

At its meeting on May 21, EJC appointed its official delegates to the UPADI Convention, with James M. Todd, past-president and Fellow ASME, as chairman, and Joseph Pope, Fellow ASME, as vice-chairman of the delegation.

The delegation to the Sectional Meeting of the World Power Conference in Rio will be under Gail A. Hathaway, official delegate and chairman of the U. S. National Committee of the World Power Conference. Other important delegates include Commissioner Dexheimer of the Bureau of Reclamation, L. C. McCabe of the Bureau of Mines, George Porter, Mem. ASME, of the Detroit Edison Company, and Ralph A. Morgen of the National Science Foundation.

ASME-ASLE First Annual Lubrication Conference

SINCE the first public announcement of the ASME-ASLE lubrication conference, which will be held at the Lord Baltimore Hotel, Baltimore, Md., Oct. 18-19, planning has reached a point where the session subjects have been clearly defined. They are as follows: Hydrostatic lubrication—the papers will deal with hydrostatic journal, thrust, and spherical bearing; bearing instability—whip and whirl in journal bearings, and turbulence in thrust bearings; new developments in hydrodynamic lubrication—recent advances in the hydrodynamics of slider bearings, cam and cam followers, and noncircular section sleeve bearings; rolling element bearings—high-speed ball-and-roller bearing operation, high-temperature ball-bearing operation in the absence of a lubricant; and materials and lubricants, gear materials; temperature and pressure—viscosity effects of oils; friction research.

The session chairmen have been selected for their outstanding ability and contributions in the field encompassed by each session. In general, this conference will be an historic and exciting occasion where two societies will join forces to present the most recent developments in the field of lubrication.

Albert A. Fava, Mem. ASME, was recently elected president of the Engineering Societies of New England. The society represents 22 leading engineering societies in metropolitan Boston and eight principal engineering societies in New England.

Jubilee at Columbia

TECHNOLOGY-JUBILEE Week, September 13 to 17, has been designated by the Department of Mechanical Engineering at Columbia University, to punctuate some particularly pertinent anniversaries as its contribution to the 1954 Bicentennial Celebration of the University.

The anniversaries to be commemorated are as follows:

10th: The Refrigeration Research Foundation

20th: The American Society of Mechanical Engineers (Refrigeration and Air-Conditioning Section of the Process Industries Division)

50th: American Society of Refrigerating Engineers

60th: American Society of Heating and Ventilating Engineers

90th: Engineering School at Columbia University

200th: Columbia University in the City of New York

The program of the week will consist of two parts, tentatively arranged as follows:

Sept. 13–15: Conference on Refrigeration

Lillian M. Gilbreth, Hon. Mem. ASME, is shown holding the Washington award, which was presented to her on April 7, in Chicago, Ill. Dr. Gilbreth is the first woman to be so honored since the award was established in 1919. Other winners include Alvord, Orville Wright, C. F. Kettering, F. B. Jewett. On the occasion she delivered an address on Management and Engineering before a large audience of distinguished leaders in engineering and industry. L. K. Sillcox, ASME President, introduced the "first lady" of engineering.

At the fourth Materials-Handling Conference held recently at Purdue University, the David Wunsch Memorial award for the best student paper on some aspect of materials-handling was presented to John V. Plenge, *left*, a junior in mechanical engineering from West Lafayette, Ind. The second place went to Richard Foster, a sophomore student in aeronautical engineering from Rochester, N. Y. The award was established at Purdue in 1950 by J. W. Wunsch, Mem. ASME. First place in the contest carries a cash prize of $100; second place, $25.

and Air Conditioning. Presentation of papers and lecturers is planned under the joint auspices of TRRF, ASME, ASRE, and ASHVE.

Sept. 15–17: Conference on Industrial Ventilation, jointly sponsored by Department of Mechanical Engineering, Columbia University, and Division of Industrial Hygiene, New York State Department of Labor.

The Jubilee technological sessions will be held in Pupin Hall, Columbia University. Registration for each conference will be limited. Inquiries are to be directed to Prof. Carl F. Kayan, Department of Mechanical Engineering, Columbia University, New York 27, N. Y.

Trends in Technology and Employment

More and better jobs for tomorrow are seen by the Council for Technological Advancement which issued a report on a study of "Trends in Technology and Employment."

"Since about 1939 the United States has been experiencing exceptionally rapid advance in science and technology," said the Council, which is affiliated with the Machinery and Allied Products Institute.

"What effects this second industrial revolution will have on employment may be most clearly seen by examining recent trends, which indicate:

"1 The proportion of jobs in manufacturing will be greater than in the past. About 25 per cent of the total labor force is engaged in manufacturing today, compared to less than 20 per cent before World War II.

"2 The proportion of jobs in trade and service occupations will increase, and some of the fastest growth will continue to be in industries and occupations providing luxury goods and services—where markets are especially stimulated by high living standards.

"3 The proportion and number of jobs on farms and in mines will probably continue to decline in the near future. Present markets there are relatively limited and job opportunities are more plentiful elsewhere. Farm population has been declining since 1916. There are only two coal miners today for every three a generation ago.

"4 Jobs calling for manual labor will continue to decline, not only in proportion but also in number. The proportion of the labor force in unskilled jobs has dropped from 36 per cent in 1910 to less than 20 per cent today, while the proportion in semiskilled, skilled, and professional jobs has risen.

"5 Demand for specialized skills will expand. Many jobs are becoming more technical. They call for more education, and they provide greater opportunity for exercise of talent and imagination.

"6 Women, especially those over 45, will constitute a growing proportion of the labor force. The expansion has been from 21 per cent of all American workers in 1920 to 30 per cent in 1953, and will perhaps be 33 per cent by 1975.

"7 Opportunities for pursuing interests beyond one's job will expand as never before, as a result of higher income, more leisure, and more education."

The report states that continuing economic expansion is a primary requirement for high employment, high real incomes, and growth in cultural opportunities. It added that economic expansion is more dependent on the advancement of science and technology than on any other single factor.

"It is technology that increases output per worker," the Council said. "Labor is made more valuable and as a result purchasing power is increased and the demand grows for all goods and services. Thus higher living standards are attained.

"Technology is the greatest of materialistic forces to lift man above materialism. Americans have been using it especially well in recent years. What technology has contributed so far is but a token of the benefits it holds for mankind."

Applied Solar-Energy Symposium Planned

A World Symposium on Applied Solar Energy will be held Jan. 12–15, 1955, at the Westward Ho Hotel, Phoenix, Ariz., under the leadership of Stanford Research Institute.

The four-day meeting of leading world scientific and industrial interests in solar-energy utilization will attempt to evaluate present knowledge in terms of practical applications. Special sessions will be devoted to the potential use of solar energy to solve problems of individual industries.

Major centers of solar-energy research in the United States will be represented and arrangements are being made for presentations by solar scientists and engineers from England, France, Germany, India, Japan, Australia, and South Africa.

The symposium will be under the general chairmanship of Lewis W. Douglas,

Pausing beneath the architect's sketch of the new $1,378,000 Engineering Center to be constructed in the downtown Cleveland, Ohio, area are A. T. Colwell, vice-president and director, Thompson Products, Inc.; Sam Littlejohn, Mem. ASME, commercial vice-president, General Electric Company; and E. L. Lindseth, Fellow ASME, president, Cleveland Electric Illuminating Company. The three men recently explained the need for an Engineering Center in Cleveland to a large audience of leading northeastern Ohio industrial executives attending a Sponsors' Dinner.

former ambassador to Great Britain and chairman of the board of the Southern Arizona Bank and Trust Company. Merritt L. Kastens, assistant director of Stanford Research Institute, is vice-chairman.

The Association for Applied Solar Energy, formed March 17, 1954, is sponsoring the symposium. Henry B. Sargent, president of the Arizona Public Service Company, is chairman of the Association's executive committee.

J. E. Hobson, SRI's director, points out that developments in solar knowledge within the past ten years make the engineering and economic feasibility of solar-energy applications promising.

Special Section Meetings

A special section meeting on agriculture at the January symposium will consider the use of solar engines to pump irrigation and drinking water; the conservation of water through accelerated culture of algae and similar foodstuff; lengthening the growing season through better absorption of solar radiation; and the development of new sources of animal and human food by more effective use of sunshine.

Representatives of the construction industries will hear reports on the use of solar energy for heating water, space heating, and cooling. Several systems for such applications have appeared practical.

A session planned for the metal-fabrication industry will be devoted to the design and construction of sun-operated pumps, heat collectors, solar stills, and chlorella-culturing equipment.

Industrial Scientists' Meeting

Industrial scientists active in fuel and power research will discuss the production of fuel gas from plant matter grown in special culture vats or from photochemical decomposition of water into hydrogen and oxygen. They will consider the possibilities of producing electric power directly from photovoltaic cells, crystals, and semiconductors, and other photoelectric units.

Discussions on materials used in chemical storing of the sun's energy and in the use of light-absorbing and transparent materials will be held for members of the chemical-process industry. High temperatures developed by solar radiation will be considered for use in chemical and metallurgical processes. The possibilities for the commercial production of chemicals by photochemical means will also be considered.

Another special session will be held for representatives of the United States, foreign governments, and large charitable foundations concerned with living standards in underdeveloped areas. According to Mr. Kastens, who is in charge of advance planning for the symposium, "The abundant energy of the sun offers the people in many regions of the earth hope of new water development, domestic heat for cooking and space heating, and possible new food and fuel sources."

EJC Issues 1953 Annual Report

THE Engineers Joint Council recently issued its 1953 annual report. The report summarizes the year's activities and includes the EJC Constitution, a list of the Council's committees for 1954, and a directory.

Events of note during 1953 for EJC included co-operation with the National Science Foundation in the preparation of a National Scientific Register, a selected Finders List of perhaps 15 to 20 thousand engineers. Also, the National Water Power Panel of the EJC has been studying water-policy problems and has established relations with government bodies in that field.

Another active project during 1953 has been the program of the Engineering Manpower Commission. One of its principal goals has been that of emphasizing to those who formulate national manpower policy the special problems affecting the engineer and other specialized personnel under both partial and full mobilization.

During the year EJC also prepared and submitted statements in connection with the professional provision of the Taft-Hartley Act to the Congressional committees studying possible revisions of this law. Other legislative activities include the presentation of a statement before the Joint Committee on Atomic Energy of the Congress with respect to modifying the Atomic Energy Act to permit engineers to make their maximum contribution toward the development of atomic energy for peacetime purposes, and the sponsorship of a bill to amend the 1952 Armed Forces Reserve Act in order to provide for the selective recall of reservists having specialized proficiencies.

Finally, the Special Surveys Committee, in co-operation with the U. S. Office of Education and the Bureau of Labor Statistics, surveyed the demand for engineers and the distribution of the supply of 1953 graduates.

Copies of the EJC Report may be obtained by writing to the Engineers Joint Council, 29 West 39th Street, New York 18, N. Y.

ASME Calendar of Coming Events

Sept. 8–10
ASME Fall Meeting, Hotel Schroeder, Milwaukee, Wis.
(Final date for submitting papers was May 1, 1954)

Sept. 13–24
ASME Instruments and Regulators Division and Instrument Society of America Exhibit and Joint Conference, Commercial Museum and Convention Hall, Philadelphia, Pa.
(Final date for submitting papers was May 1, 1954)

Sept. 26–29
ASME Petroleum-Mechanical Engineering Conference, Hotel Statler, Los Angeles, Calif.
(Final date for submitting papers was May 1, 1954)

Oct. 28–29
ASME-AIME Joint Fuels Conference, William Penn Hotel, Pittsburgh, Pa.
(Final date for submitting papers was June 1, 1954)

Nov. 28–Dec. 3
ASME Annual Meeting, Statler Hotel, New York, N. Y.
(Final date for submitting papers was July 1, 1954)

Feb. 16, 1955
The Founding Anniversary Meeting, McGraw-Hill Building, New York, N. Y.
(No formal papers will be presented)

March 23–24, 1955
ASME Management Conference, Hotel Statler, Cleveland, Ohio
(Final date for submitting papers—Nov. 1, 1954)

April 16, 1955
The Organization Anniversary Meeting, Stevens Institute of Technology, Hoboken, N. J.
(No formal papers will be presented)

April 18–21, 1955
Diamond Jubilee Spring Meeting, Lord Baltimore Hotel, Baltimore, Md.
(Final date for submitting papers—Dec. 1, 1954)

Junior Forum . . .

Conducted by Joseph Schmerler, Assoc. Mem. ASME

Engineering an Engineer

A Postcollege Program of Development

WHEN a young engineer decides with which company to accept his first job, he is only partially qualified to make this determination. Yet his entire future may be dependent upon making the right choice. Once out of school, his further progress is governed by an integration of numerous forces previously absent during his college career. These forces when properly utilized, exploited, and controlled can shape a gratifying future in engineering for a young man.

The engineering profession recognizes this situation and strives to co-ordinate and further the efforts made by education, industry, and the community in developing a satisfactory position for its engineers.

At the ASME International Meeting, Mexico City, D. F., March 10–12, 1954, K. B. McEachron, Jr.,[1] delivered a talk which stressed such a program of activity.

Following is an abstract of that address.

The most serious problem facing the engineering profession today is the development of leaders, both in the technical and management fields. The development of such leaders depends not only on the quality of their formal education in college, but also upon the postcollege training which they receive. While engineering education in college is carefully planned to provide an adequate foundation for an engineering career, there has been no similarly well-organized program to continue and extend the development of young engineers after leaving school.

The Need for a Program

Recognizing the need for a plan of positive action during this period, the Engineers' Council for Professional Development assembled, under A. C. Montieth,[2] a Training Committee which prepared a manual entitled "The First Five Years of Professional Development." This manual covers six main aspects of the problem.

ECPD Program

The first section is "Orientation and Training in Industry." From the job standpoint, the young engineer should be made to feel that he is wanted, that he is a part of the organization, and that his new associates are willing and anxious to help him. The most effective method of instilling this feeling and developing engineering graduates is through the use of a training program. In preparing its manual, the Engineers' Council paid particular attention to the training needs of smaller organizations. Whether in a large or a small company, the training program must be of a work-experience type of activity—true on-the-job training. It must be based on the principle of "learning by doing." Unless it has such a basis the training program is not satisfactory for industry.

The second portion of the manual concerns "Continued Education" of the young engineer. Large companies have organized extensive courses at advanced levels for interested engineers. Smaller concerns have made arrangements with local colleges to provide courses to continue the education of their young engineering graduates. It is the purpose of this program to bring together industries which need such courses and the colleges that are equipped to provide them.

Integration Into the Community

Third is "Integration Into the Community." Since this part of the program is a distinctly personal one and is related to so many different groups in the community, it is probably the most neglected area of all. The amount of integration of a man's family into the community is directly reflected in measuring satisfaction of his job.

Usually the only one expecting the young man's arrival is his employer and he seldom is prepared to introduce the new family into the community. The groups prepared to do so are normally not aware of the problem until it is too late. The Engineers' Council, through this part of its program, brings these groups together to welcome the new member and introduce him into organizations to which he and his family will want to belong as participating members of the community.

"Professional Registration" is the fourth area covered by the Engineers' Council's program. The practice of professional engineering, like the practice of medicine or law, is regulated by state laws. The purpose of such regulation is to protect the public by preventing unqualified individuals from practicing engineering. Employers of engineers are urged to become familiar with the significance of registration. Otherwise, considerable legal difficulty may arise with regard to practice of engineering by unregistered employees where registration is required.

The fifth point in the program is "Self-Appraisal." In most cases the student engineer appraised himself and asked, "What do I like to do?" and "What can I do?" These and other pertinent questions are contained in a self-appraisal questionnaire form in the Council's manual for effective use by the engineering student and graduate. On the basis of his answers the young graduate engineer is encouraged to discuss his future with an older engineer or his supervisor in the company for which he works.

"Selective Reading" for engineers in technical, business, and professional areas is the sixth portion of the program. Such a recommended list of reading has been one of the activities of the Engineers' Council for Professional Development for many years and is a highly effective one.

First Five Years of Professional Development

"The First Five Years of Professional Development" covers the six points just described in much fuller detail. The recommendations contained in the manual are available to anyone who will study and apply them. They are limited to neither small nor large companies. In fact, in appropriate sections of the manual the material is subdivided in terms of company size. The program is limited only by the imagination and vision of those in charge in the particular company and in the particular community.

[1] Assistant to Manager of Engineering, household Refrigeration Department, General Electric Company, Erie, Pa. Mem. ASME.

[2] Vice-President in Charge of Engineering, Westinghouse Electric Corporation, Pittsburgh, Pa. Hon. Mem. ASME.

Farny Scholarship Report

Two Sylvia W. Farny Scholarship awards were granted this spring by the Woman's Auxiliary to The American Society of Mechanical Engineers. This was made possible by the generous and increasing contributions to this fund by the members of the Auxiliary Sections. The recipients are John W. Smylie, 329 South Railroad Street, Brookhaven, Miss., and Arthur Samuel Rathbun, 58 William Street, Westerly, R. I.

Recipients of 1954 Awards

Mr. Smylie is a student at Mississippi State College. He entered college in September, 1951, and expects to be awarded an ME degree in May, 1955. Mr. Smylie is a young man of exemplary character, and scholastically he is outstanding. He is carrying an academic schedule considerably heavier than that recommended for the average student.

At the beginning of his junior year he was initiated into Tau Beta Pi, Honorary Engineering Society, which classifies him as an "honor student." In addition, he is a member of Phi Eta Sigma, Honorary Freshman Society, Kappa Mu Epsilon, Honorary Mathematics Society, and the ASME Student Branch. He also finds time to serve as a student grader in three engineering courses. Among the extracurricular activities in which he participates are Kappa Alpha Order, copy editor of school paper, and Westminster Fellowship.

Mr. Rathbun entered college in September, 1950, and expects to graduate from Rensselaer Polytechnic Institute in June, 1955. He is enrolled in a five-year engineering course, participating in the affiliated program which Rensselaer has with Trinity College of Hartford, Conn. He has just completed his first year at RPI, having completed three years at Trinity.

Mr. Rathbun has an excellent scholastic record at both colleges and is a young man of fine character. He was initiated into Phi Beta Kappa at Trinity and is a member of Sigma Pi Sigma Physics Society. Also, he is a Student Fellow of the ASME Student Branch at RPI. In addition, Mr. Rathbun was on the varsity basketball team for three years at Trinity, a member of the Brownell Club, and Inter Dorm Council, and Engineering Club Section. He was in a Junior heat-engineering class at RIP last fall and was the outstanding man in the class.

Sylvia W. Farny Scholarship

The Sylvia W. Farny Scholarship Fund was established in 1952 and provides $500 in each scholarship. The scholarship is awarded to an American man or woman undergraduate student in mechanical engineering, enrolled in an accredited curriculum in a college or university in which there is a Student Branch of ASME, for use in his or her final year of study. The scholarship is based on current financial need and scholastic achievement. It was named in honor of the late Sylvia W. Farny, who was a national president and an honorary member of the Auxiliary, as a fitting tribute to her enthusiasm, foresight, and leadership.

Student Loan Fund

In addition to the Sylvia W. Farny Scholarship, the Woman's Auxiliary to The American Society of Mechanical Engineers also administers a Student Loan Fund, which at the present time has 24 student loans outstanding in a total amount of more than $800, and the Calvin W. Rice Memorial Scholarship Fund, which is awarded annually to a foreign student of engineering.

Mrs. Charles M. Hickox, 31 Cary Road, Great Neck, L. I., is national president of the Woman's Auxiliary and Mrs. Ralph L. Goetzenberger of 714 Norway Drive, Kenwood, Chevy Chase, Md., is the chairman of the Sylvia W. Farny Scholarship Fund Committee.

Actions of the ASME Executive Committee

At a Meeting at Headquarters, May 21, 1954

A MEETING of the Executive Committee of the Council was held in the rooms of the Society on May 21, 1954. L. K. Sillcox, chairman, presided. In addition to Mr. Sillcox, there were present: Thompson Chandler, H. E. Martin, A. C. Pasini, and W. F. Thompson of the Committee; Joseph Pope, chairman, Finance Committee; J. L. Kopf, treasurer; H. R. Kessler, vice-president; Paul R. Yopp, vice-president; C. E. Davies, secretary; and O. B. Schier, 2nd, assistant secretary. F. S. Blackall, jr., past-president; D. W. R. Morgan, director; and E. J. Kates, assistant treasurer, were present part of the time.

New Members

Five members of the American Institute of Electrical Engineers have been elected to membership in the ASME. Under the reciprocal arrangement with AIEE, the Committee authorized reduction in dues payments.

1955 National Meetings

The Board on Technology, it was reported, approved the following national meetings to be held during 1955, the 75th Anniversary Year of the Society: McGraw-Hill Meeting, New York, N. Y., February 16; Stevens Institute of Technology Meeting, Hoboken, N. J., April 16; Spring Meeting, Baltimore, Md., April 18–21; Semi-Annual Meeting, Boston, Mass., June 19–23; and Diamond Jubilee, Annual Meeting, Chicago, Ill., November 13–18.

Safety-Division Fellowships

The Committee approved the allotment to the Safety Division of $1500 to establish a Fellowship to undertake a "pilot" study on integrating safety principles into mechanical-engineering courses in colleges and universities.

Section Changes

The following changes in Section territories were approved: (1) Monmouth, Middlesex, Somerset, Hunterdon, and Union Counties (N. J.), now in the Metropolitan Section, were assigned to the Plainfield Section; (2) the Plainfield Section was assigned permanently to Region II; and (3) Delaware County, N. Y., was assigned to the Schenectady Section, and Otsego and Chenango Counties were assigned to the Syracuse Section.

High-Temperature Piping Research

F. S. G. Williams, chairman of the Sectional Committee on Code for Pressure Piping, ASA B31, in a communication dated May 12, 1954, requested an appropriation of $10,000 for fundamental research work on design of piping for high-temperature service, with direct reference to the problem of expansion and flexibility. Mr. Williams reported that at the 1953 ASME Annual Meeting a series of papers dealing with this subject were presented, two of which represented fundamental research work at the Knolls Atomic Laboratory.

The Sectional Committee believes that it is vitally important that this research work be extended. Cost of completing the program by Jan. 1, 1955, is estimated at $20,000. The United States Navy, which sponsored the original work, and the Atomic Energy Commission have agreed to allocate $10,000 provided industry would match this commitment. The Sectional Committee, therefore, made a specific request for the $10,000.

With the understanding that the Standardization Committee and the Board on Codes and Standards approve, the Committee authorized the sum for fundamental research work at the Knolls Atomic Laboratory with the understanding that it will be repaid in a year.

Man-Mile Plaques

It was reported that the Norfolk and Western Railroad Company donated 12 "man-mile" plaques, cast in bronze, one to each of the 12 Regional Student Conferences. They were arranged for through the co-operation of C. E. Pond, Mem. ASME, superintendent of motive power, Roanoke, Va. The Committee directed the Secretary to extend appreciation to Mr. Pond.

Certificates of Award

Certificates of award were granted to Ercole Rosa, Jr., retiring secretary, Management Division; and T. A. Marshall, Jr., retiring chairman of the Division.

The following retiring chairmen of Sections were awarded Certificates: Melvin H. Ripple, Canton-Alliance-Massillon; Herbert Dobkin, Plainfield; Lindon E. Saline, Schenectady; D. A. Holden, Virginia; and George M. Rosengarten, West Virginia.

The following past-chairmen of Sections were granted Certificates: Warren Schmidt, 1951-1952, John Bodnar, 1952-1953, Fairfield County; and David A. Fisher, 1952-1953, Hartford.

Charles C. Di Ilio, retiring Honorary Chairman of the ASME Student Branch at the Penn State University, also was granted a Certificate of Award.

Committee of Five Presidents

It was reported that the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, the American Institute of Electrical Engineers, and the American Institute of Chemical Engineers all had taken action on the new engineering-societies building parallel to that taken by the ASME in April. The Committee of Five Presidents is therefore now in being.

The president of ASME was authorized to state to the Committee of Five Presidents the following current position of ASME:

"The ASME favors the establishment of a workshop building outside, but within easy reach of New York City, with a minimum renting space for necessary meetings in a suitable location in the center of the City, or the rehabilitation of the present building.

"Nothing in this position prevents the President, in his judgment, from considering other locations and other plans. Should such proposals arise they will be referred to the Executive Committee of the Council for further advice."

New Engineering Societies Building

The report of the tellers on the ballot to the membership on the question of permitting the Council to decide for the ASME the location of the new engineering-societies' headquarters was presented. Out of 17,418 ballots cast, 16,279 were in favor of letting the Council decide the location and 939 were against.

E. Graham Clark

The death of E. Graham Clark, secretary of The Institution of Civil Engineers of London, England, on April 23, 1954, was reported. The Society was represented at memorial services in London on May 17 by J. Foster Petree. The Secretary was directed to transmit a letter of regret and tribute to the Institution and the family of Mr. Clark.

Engineering Education

An expression of appreciation was received from the American Society for Engineering Education for the ASME's financial contribution to the project Evaluation of Engineering Education. (See MECHANICAL ENGINEERING, December, 1953, pp. 1037–1039.)

John Fritz

The John Fritz Medal Board of Award was asked by the Chester County Historical Society of Pennsylvania to contribute $800 to pay for a bronze plaque mounted on a field boulder adjacent to the log house in which John Fritz was born. The Board asked the representatives of participating societies to confer with their respective societies to learn their interest in this project.

Preliminary plans include dedication of the plaque during the summer months with the John Fritz Medal Board of Award in attendance and representatives of Bethlehem and other steel companies with whom John Fritz was associated.

The Executive Committee authorized $200 toward the John Fritz plaque, provided the other participating societies take parallel action.

Appointments

The following appointments on committees and joint activities were approved:

H. L. Walton, G. T. Trundle, Jr., R. C. Roe, G. C. Daniels, and J. A. McPherson to the Committee on Professional Practice of Consulting Engineering;

E. V. Johns to Boiler Code Subcommittee, Openings and Bolted Connections;

O. R. Carpenter to Boiler Code Subcommittees, Unfired Pressure Vessels, and Special Committee on Layer Vessels;

H. E. Martin to United Engineering Trustees, Inc.;

L. K. Sillcox to John Fritz Medal Board of Award; and Rolland S. Stover to the Washington Award Commission.

The following presidential appointments were confirmed: F. S. Blackall, jr., alternate for President Sillcox, on Committee of Five Presidents;

F. M. Gunby to 50th anniversary and inauguration of president, Wentworth Institute, May 22, 1954;

B. G. Elliott, to annual dinner of the National Society of Professional Engineers, June 12; and H. N. Meixner to annual meeting, American Society for Engineering Education, June 14–18, 1954, Urbana, Ill.

National Nominating Committee

A. T. Kniffen and H. J. Skarbek were approved to serve as second alternate and third alternate, respectively, on the National Nominating Committee, Region II.

Engineering Societies Personnel Service, Inc.

THESE items are from information furnished by the Engineering Societies Personnel Service, Inc., in co-operation with the national societies of Civil, Electrical, Mechanical, and Mining and Metallurgical Engineers. This Service is available to all engineers, members, or nonmembers and is operated on a nonprofit basis.

In applying for positions advertised by the Service, the applicant agrees, if actually placed in a position through the Service as a result of an advertisement, to pay a placement fee in accordance with the rates as listed by the Service. These rates have been established in order to maintain an efficient nonprofit personnel service and are available upon request. This also applies to registrant members whose availability notices appear in these columns. Apply by letter, addressed to the key number indicated, and mail to the New York office.

When making application for a position include six cents in stamps for forwarding application to the employer and for returning when necessary. A weekly bulletin of engineering positions open is available at a subscription of $3.50 per quarter or $12 per annum for members, $4.50 per quarter for nonmembers, payable in advance.

New York	Chicago	Detroit	San Francisco
8 West 40th St.	84 East Randolph St.	100 Farnsworth Ave.	57 Post St.

Men Available[1]

Engineer, Physicist, PhD, EE; licensed engineer; now executive vice-president AAAA corporation in Chicago; former dean of engineering, also research director; metalworking, instruments, controls. Desires administrative position in education or industry. Will relocate. Me-102-878-Chicago.

Mechanical Engineer, BSME, 29; broad experience in methods and materials handling. Presently responsible for manufacturing and design activities for materials-handling equipment company. Desires responsible position with medium-sized firm co-ordinating design and manufacture to maximize profits. Me-103.

Mechanical Engineer, 30, U. S. citizen, nine years' experience including stress analysis, aircraft engines, turbines, heat transfer, and machinery. Desires position with company in aircraft-engine field. Me-104.

Management Engineer, IE, 30, diversified experience in industrial engineering. Desires work simplification, systems and methods, cost and flexible budget control, profit planning, production control, and cost-reduction work. Me-105-905-Chicago.

[1] All men listed hold some form of ASME membership.

Positions Available

Sales Engineer, 30–40, mechanical or electrical graduate, at least five years' sales experience in auto-parts and accessories fields, to sell stampings and metal products. $10,000-$12,000. Mich. Y-9820-D-9223.

Sales Engineer, degree in mechanical engineering preferred. Previous selling experience of heavy industrial equipment or a little mechanical-engineering experience helpful. Work involves correspondence with prospective customers in answer to inquiries for equipment, consulting with prospective customers on their straightening problems, and preparing difficult and lengthy quotations. $4500–$5000. Pa. Y-9823.

Staff Engineer, mechanical graduate, 35–40, process-plant engineering experience, to assist chief engineer on design and layout of process equipment. Some traveling. $8500–$9000. Westchester County, N. Y. Y-9827.

Staff Industrial Engineer, 35–45, engineering graduate, at least five years' successful experience in industrial engineering covering plant layout, materials handling, packaging, and general cost-reduction work in process industry. $9000–$10,000. Westchester County, N. Y. Y-9880.

Quality-Control Engineer, mechanical graduate, to take charge of and inspect containers and assist in various kinds of packaging problems for chemical-process industry. To $7200. Central New York State. Y-9889.

Project Engineer, 28–35, mechanical graduate, experienced in the design and development of processing units, in general. Ability to handle problems involving bearings under conditions of high speeds and elevated temperatures, high-temperature metals and materials, glass-melting furnaces or cupolas; use of steam and air for processing with high-pressure jets and heat-transfer units desirable. Work will involve design and development of processing equipment. Salary open. N. J. Y-9902.

Design Engineers "A," 35–55, mechanical degree, heavy structural or machine-design experience, to lay out and design products to customers' specifications; check drawings for correct design and details prior to issuing them to the shop; make engineering calculations, interpret blueprints, sketches, etc., maintain control of design changes, etc. $6996–$9756. Ohio. Y-9910.

Plant Engineer, 35–45, at least five years' experience in administrative type of engineering and preferably in paper mills. Knowledge of hydraulics helpful. Will handle maintenance, power and engineering problems for a pulp, paper, and converting mill for a paper manufacturer. $10,000–$12,000. Employer will negotiate fee. Ala. Y-9980.

Director, marketing research, 35–45, eight to ten years' marketing-research experience applied to industrial markets. Should have degree in business administration or mechanical engineering, experience in marketing research or statistics, and have held responsible position in marketing-research activities. Upstate New York. Y-9991(a).

Project Engineer, 30–45, mechanical-engineering degree; five years' experience covering product development and design projects involving problems in mechanics and hydraulics; rolling, welding, forming, and forging of medium to heavy-steel and alloy metals, including tooling requirements. $6000–$9000. Western Pa. W-22.

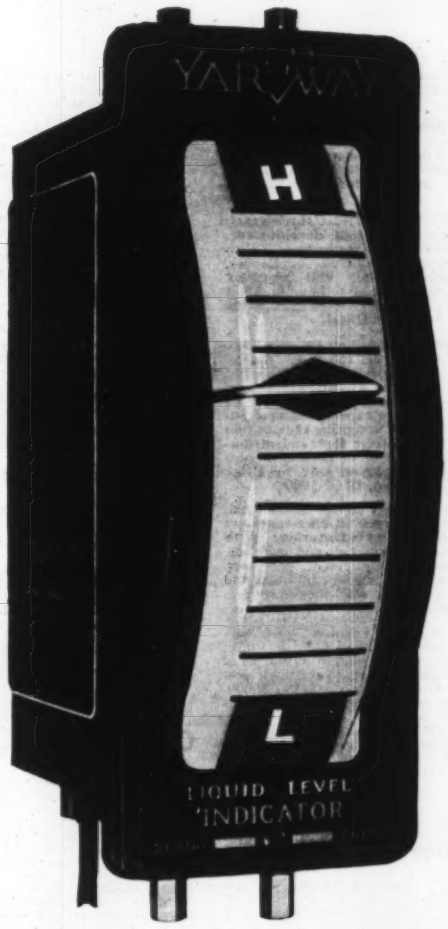
Sales and Installation Engineer for distributor of air-conditioning equipment in Saudi Arabia. Must be single. Two-year contract. $15,000. F-36.

Project Engineer, graduate mechanical, for field and office work on boiler pumps and general industrial power-station work. Will contact clients for consulting-engineering company. $8000–$10,000. New England. W-37.

Development Engineer, mechanical, development of turbine experience, similar to high-speed rotating equipment such as Fairchild Aircraft reaction motors. Up to $8000. N. J. W-69.

Materials-Handling Engineer, to investigate and solve methods of handling raw materials and products in process; flow of material through warehouses; and final packaging of the finished product; methods must be established on the bases of reducing the time cycle involved, keeping costs at a minimum, etc. Should also be able to revise layouts and design or recommend specifically needed equipment. Pa. W-72.

(*ASME News continued on page 630*)



new WIDER VISION

for easier remote boiler water level readings

■ Vastly improved visibility of remote boiler water level readings can now be enjoyed by boiler plant operators.

A new "wide vision" face on Yarway Remote Liquid Level Indicators allows reading from the side as well as front of the indicator. Boiler water levels and other liquid levels can be checked from most any position.

Indicating mechanism is operated by the boiler water level itself—assuring instant, accurate readings.

Yarway Indicators are of the manometric type with automatic temperature compensation, as approved for use under the recent A.S.M.E. Boiler Code Committee ruling in Case #1155.

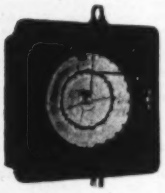
Over 10,000 are used throughout industry for boiler water and other liquid level indication . . . and for superheater pressure differential indication aboard ship.

For full information write for Bulletin WG-1823.

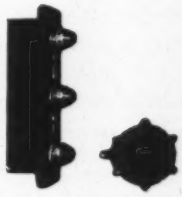
YARNALL-WARING COMPANY
100 Mermaid Avenue, Philadelphia 18, Pa.
BRANCH OFFICES IN PRINCIPAL CITIES

A COMPLETE YARWAY SYSTEM

Besides Remote Liquid Level Indicators, Yarway also offers Liquid Level Recorders and Remote Signal Alarms . . . making a complete system for constant, accurate liquid level check.



■ Yarway Hi-Lo-Graph Recorder provides not only water level indication, but also a 24-hour recording of water levels. See Yarway Bulletin WG-1830.



■ Yarway Remote Hi-Lo-Alarm Signals—lights or horns—can be placed at any location in plant. See Yarway Bulletin WG-1823.

YARWAY / ***remote liquid level indicators***

Assistant Industrial-Relations Manager, about 30, graduate, two to three years in wage-and-salary administration, job-evaluation and union-contract negotiator for manufacturing concern. $5000–$7000. Upstate N. Y. W-74.

Associate Professor or Professor, under 50, at least MS in mechanical engineering, to teach hydraulics, mechanics, thermodynamics, power, and supervise laboratory courses. $6000–$7000, 11 months. Pakistan. P-86.

Engineers. (*a*) Editor-in-Chief, preferably mechanical graduate, considerable experience in technical writing on heating, ventilating, and refrigeration. Will be in charge of monthly magazine and annual publication. $10,000–$12,000. (*b*) Editor and technical secretary, mechanical graduate, to assist committees in compiling data and the publication of data material. $6000–$7000. New York, N. Y. W-98.

Engineers. (*a*) Manufacturing consultant to develop and prepare instructions for designing electromechanical devices in a manner compatible with manufacturing processes, and consult with and advise engineers and designers on technical problems in this area. Manufacturing experience with good knowledge of sheet-metal, spot-welding, and brazing operations; and a flare for writing desirable. (*b*) Ball-bearing specialist to advise and consult with product engineers and designers on the characteristics and proper application of instrument-type ball bearings in electromechanical devices. Also, consult with production and quality-control engineers on technical problems encountered in those areas. Knowledge of instrument design and manufacture desirable. (*c*) Vibration and shock specialist to advise and consult with engineers and designers on the characteristics and proper application of vibration isolators and shock mounts in aircraft, ship, and mobile installations. Knowledge of government specifications pertaining to application of these components desirable. Salaries open. Metropolitan New York. W-102.

Die Designer, to 45, at least five years' experence in die-design work, preferably bending die; knowledge of operation of press brakes and notching presses. Will start as die designer and if capable will become department head, for a manufacturer of special heavy equipment. $6600–$7200. Employer will pay fee. Western Pa. C-1938(*a*).

Chief Engineer, graduate or equivalent, to 55. Ten years' experience in machinery-design field. Will be in charge of design of a standard line of woodworking machines. Employer will pay fee after one year's employment. South Wis. C-1942.

Product Engineer, 25–45, at least three years' experience in gas-appliance design, development, or practical application of gas equipment. With knowledge of gas burners, controls, appliances, A.G.A. codes and requirements. Will do project engineering, covering design, development, pilot model, and allied work. Up to $8400. Employer will negotiate fee. Ind. C-1949(*a*).

Design and Development Engineer, graduate mechanical, about 40, at least ten years' experience, for the design and development of heavy and semiheavy equipment, plus knowledge of steel and metallurgy. Must have personality to go out with salesmen and give expert technical advice. Should be capable of accepting the position of chief engineer after relatively short indoctrination period, for manufacturer of railroad equipment. $8400, plus. Employer will negotiate fee. Headquarters, Chicago, Ill. C-1960.

Fiber-Container Engineer, 25–40, mechanical, at least one year's experience in fiber-container production, processing, or manufacturing. With knowledge of production processes and methods. Will set up and maintain equipment, processes, and methods for production of fiber containers and drums. $6000. Employer will negotiate fee. Chicago, Ill. C-1967.

Engineers. (*c*) Research engineer, gyro, mechanical engineer preferred, BS, MS, or PhD.; to 54. Will work on multiaxis gyro platforms of extremely low friction, low error and high precision. Must be U. S. citizen. $4800–$9600. (*d*) Design engineer, mechanical, BS, or equivalent, to 54, at least five years' experience in related fields. Will do design of mechanical component on highly complex devices such as gyros, etc. Must be U. S. citizen. $4800–$7200. Employer will pay fees. Minn. C-1968.

Candidates for Membership and Transfer in the ASME

THE application of each of the candidates listed below is to be voted on after July 23, 1954, provided no objection thereto is made before that date and provided satisfactory replies have been received from the required number of references. Any member who has either comments or objections should write to the Secretary of The American Society of Mechanical Engineers immediately.

Key to Abbreviation

R = Re-election; Rt = Reinstatement; Rt & T = Reinstatement and Transfer to Member

New Applications

For Member, Associate Member, or Affiliate

ADAMS, WILLIAM E., Westbury, N. Y.
ANGST, WALTER, Sidney, Ohio
BAKER, LORNE P., Port Credit, Ont., Can.
BARQUIN Y RUIZ, PEDRO, Central Delicias, Oriente, Cuba
BIRD, LEVI C., Oak Park, Ill.
BOEHM, GEORGE A. W., New York, N. Y.
BOTTERON, LEONARD, Calumet City, Ill.
BRADEN, DONALD S., Cleveland Heights, Ohio
BREFFEILH, GEORGE A., Venezuela, S. A.
BROWN, ALLAN G., Chattanooga, Tenn.
BROWNLEY, TYEN L., Augusta, Ga.
BURT, PETER J., Phoenix, Ariz.
BURTON, VERNON W., Pittsburgh, Pa.
BUTLER, ALBERT Q., JR., Freeport, Texas
BYAW, B. AUNG., New York, N. Y.
CAMPBELL, WILFRED E., Cleveland, Ohio
CARPENTER, OTIS R., Barberton, Ohio
CARROLL, FRANK E., JR., Dayton, Ohio
COOK, DOUGLAS R. J., Port of Spain, Trinidad, B. W. I.
CRILEY, WAYNE, Flushing, L. I., N. Y.
DE CHAUD, JOHN E., Chicago, Ill.
DORMAN, CLIFFORD W., Milwaukee, Wis.
ELIADES, THEODORE H., East Orange, N. J.
FEELY, FRANK J., JR., Westfield, N. J.
FLAR, HENRY, Mountain Lakes, N. J.
FRASER, DONALD F., Palmyra, N. Y.
FULCHER, JOHN H., Ottawa, Ont., Can.
GARVEY, WILLIAM J., Brentwood, Mo.
GRINDER, FLORIAN, Silver Spring, Md.
GUTENTANNER, ROBERT B., Shreveport, La.
GLOVER, DONALD D., Columbus, Ohio
GRAMANN, HENRY T., Houston, Texas
GURNEY, ROBERT D., Clay, N. Y.
GUSSETT, NORWICK B., Des Moines, Iowa
HAHN, NORMAN F., Cleveland, Ohio
HAMMER, LEWIS E., Wellsville, N. Y.
HAN, LIT SIEN, Columbus, Ohio
HENDON, JAMES BENTLEY, Overland Park, Kan.
HOENIG, STUART A., Great Neck, L. I., N. Y.
HUBER, MATTHEW W., Watertown, N. Y.
HUMMER, JOHN L., Saginaw, Mich.
JACOBS, GORDON W., Cincinnati, Ohio
JOHNS, ERNEST V., Barberton, Ohio
JONES, MILTON O., Sandia Base, Albuquerque, N. Mex.
KARNOUTSOS, NICHOLAS, Rutherford, N. J.
KECK, JULIAN W., JR., Atlanta, Ga.
LAFERTY, ROBERT W., Woodbury Heights, N. J.
LAKE, FRANCIS K., Brooklyn, N. Y.
LANKERING, FREDERICK W., Paterson, N. J.
LARSON, TOM L., Severna Park, Md.
LEVITT, DONAL, Baldwin, L. I., N. Y.
LIGHT, ROBERT J., Chesaning, Mich.
LUTH, PERRY A., JR., Los Angeles, Calif.
MACONEGHY, MILTON P., Romulus, N. Y.
MADDEX, JOHN N., Pinole, Calif.
MALTAS, LA VERNE C., New York, N. Y.
MARATOS, CHARLES, Ozone Park, N. Y.
MATTERN, JOEL H., Lansdowne, Pa.
MCMENAMIN, JOHN H., Amarillo, Texas
MCMURRAY, JOHN C., Bound Brook, N. J.
MCNALLY, EUGENE, Silsbee, Texas
MENDOZA, CLEMENTE M., Mexico City, D.F., Mex.
MIKLOWITZ, JULIUS, Pasadena, Calif.
MILLER, AUGUSTUS T., College Park, Ga.
MILNE, GEORGE H., Fort Erie, Ont., Can.
MOLICH, KAI, New Rochelle, N. Y.
MOODY, LEWIS F., JR., New York, N. Y.
NARA, HARRY R., Cleveland, Ohio
NATH, KRISHNARAO V., Purasawalkam, Madras, India
NELSON, ALBERT T., JR., St. Petersburg, Fla.
NORTON, RICHARD C., Los Angeles, Calif.
NOVOTNY, JOHN J., Towson, Md.
O'CONNOR, LEO J., Hamilton, Ont., Can.
OTT, MARION LEROY, Amarillo, Texas
PERLER, ANDERSON, New York, N. Y.
PETIT, ELWOOD P., San Francisco, Calif.
POWER, ROBERT B., South Charleston, W. Va.
PRESTELE, JOSEPH A., Englewood, N. J.
PRICE, DANIEL E., Arlington, Va.
RAMSEY, WOODROW W., Denver, Colo.
RIBAR, GEORGE A., JR., Arlington, Mass.
ROBB, EGERTON S., New York, N. Y.
ROBERTS, WILLIAM A., Milwaukee, Wis.
RUSSELL, SAMUEL T., Rye, N. Y.
SCHROEDER, WALTER M., Gloversville, N. Y.
SEIDER, LEO J., Philadelphia, Pa.
SHAFER, HOWARD S., Tulsa, Okla.
SNOWDEN, CHARLES E., JR., West Medford, Mass.
SOUDER, JOHN C., Mountainside, N. J.
SPINELLA, PHILIP A., East Hartford, Conn.
STOCKLI, OSCAR W., St. Johns, Que., Can.
STONE, BERNARD G., Chicago, Ill.
STOUT, JOHN B., Oklahoma City, Okla.
TAYLOR, WILLIS J., Dallas, Texas
THOMSEN, ERICH G., Berkeley, Calif.
TROISI, DINO R., Woodhaven, N. Y.
UGALDE, VICENTE, Mexico City, D.F., Mex.
VAN DEN HOUTEN, JAN H., Grand Rapids, Mich.
WALLER, EDWIN J., Stillwater, Okla.
WHITE, GERALD B., Prairie Village, Kan.
WILLIAMS, ROBERT D., New Kensington, Pa.
WILSON, CORNELIUS J., Massillon, Ohio
WILSON, FRED A., Kenmore, N. Y.
WOHLSCHLEGEL, ERNEST I., San Antonio, Texas
YODER, WILLIAM B., Glenside, Pa.
YU, JIMMY S. K., Detroit, Mich.
ZICHWIC, JOSEPH E., Tulsa, Okla.

Change in Grading

Transfers to Member, Associate Member, or Affiliate

ABEL, WALTER L., Wenham, Mass.
ANDERSON, CRAWFORD S., JR., Wymberley, Savannah, Ga.
CORT, AMBROSE, JR., New York, N. Y.
GAMON, THOMAS H., Chattanooga, Tenn.
HALL, ALVIN C., Woodbury, N. J.
LANDSBERG, ROY D., Grand Rapids, Mich.
LOWEN, WALTER, Schenectady, N. Y.
MCAULAY, FREDERICK L., St. Louis, Mo.
MORGAN, DAVID W. R., JR., Swarthmore, Pa.

Transfers from Student Member to Associate Member 202

Obituaries . . .

Wright L. Felt (1893–1954?), whose death was recently reported to the Society, was area representative, Housing and Home Finance Agency, Office of Administration, Region VIII, Los Angeles, Calif. Born, Meridian, Texas, May 21, 1893. Parents, Sumner D. and Nellie L. (Holland) Felt. Education, BS(ME), University of Oklahoma, 1916. Married Freda M. Brown, 1919; children, James W., Joan M. Mem. ASME, 1938. Author of several articles published in technical and trade journals.

E. Edward Hoffman (1887–1954), director, industrial finishes division, National Paint, Varnish, and Lacquer Association, Washington, D. C., died in March, 1954. Born, New York, N. Y., July 21, 1887. Education, ME, Columbia University, 1910. Mem. ASME, 1938.

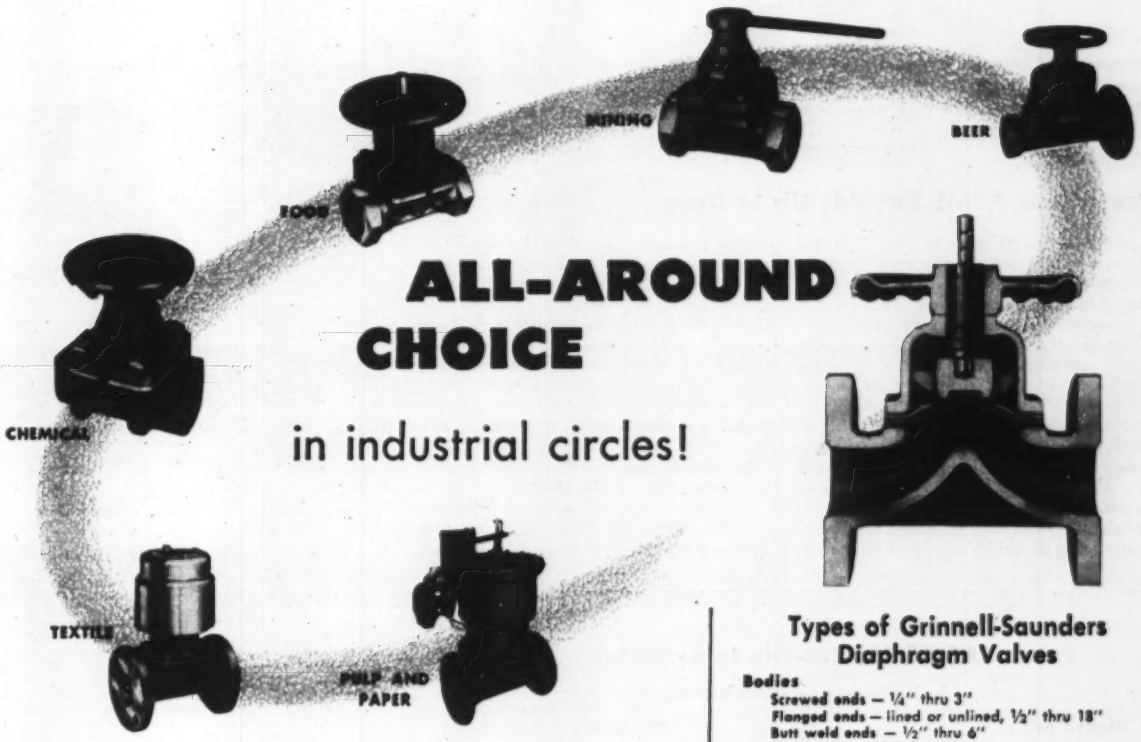
Harry L. Keller (1888–1954), vice-president, Mahoning Designers, Inc., Youngstown, Ohio, died April 8, 1954. Born, Bowling Green, Ohio, Oct. 27, 1888. Education, mechanical drafting and engineering, ICS. Mem. ASME, 1946. He served the Society on Standardization Committees B1, Y14, B4, and various subcommittees pertaining to these bodies.

John Armand Lafore (1873–1951), retired engineer, Philadelphia, Pa., died Sept. 12, 1951, according to a notice recently received by the Society. Born, Philadelphia, Pa., Sept. 17, 1873. Parents, John E. and Josephine (Dibble) Lafore. Education, BS, Swarthmore College, 1895; CE; EE; ME. Married Anne P. Shearer, 1904; children, John A., Jr., Robert W., Helen (Mrs. Edward L.) Forstall, Lawrence D. Mem ASME, 1904.

Gustav Ludwig Larson, (1881–1954?), chairman, mechanical-engineering department, University of Wisconsin, died recently according to a notice received by the Society. Born, Werpinge, Lund, Sweden, June 30, 1881. Parents, Ole and Ingrid (Sjöstrom) Larson. Education, BS(EE), University of Idaho, 1907; ME, University of Wisconsin, 1915. Married Marion Frances Anthony, 1904; children, Dorothy A., Foster A. Mem. ASME, 1915; Fellow ASME, 1951. He served the Society as chairman, Rock River Valley Section, 1940. He wrote several technical papers which were published in professional journals. Received Wisconsin Utilities Association Award, 1952.

Thomas William Masterson (1899–1953), district engineer, Westinghouse Air Brake Co., Chicago, Ill., died Oct. 23, 1953. Born, Greigsville, N. Y., Dec. 10, 1899. Education, Carnegie Institute of Technology, 1920. Mem. ASME, 1948.

(*ASME News continued on page 632*)



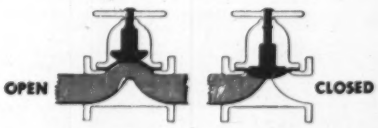
ALL-AROUND CHOICE

in industrial circles!

GRINNELL-SAUNDERS DIAPHRAGM VALVES

In industrial plants all around, Grinnell-Saunders Diaphragm Valves are preferred. *Why?* Because they have proved themselves economical and efficient in handling materials as diversified as corrosive fluids, gases, beverages, foods, compressed air, suspended solids . . . in lines where corrosion, abrasion, contamination, clogging, leakage and maintenance are costly factors.

Grinnell-Saunders Diaphragm Valves are available in a range of bodies, linings and diaphragm materials . . . and in a variety of styles and operating mechanisms. If you have a valve problem, it certainly will be well worth your while to consult a Grinnell engineer.



Types of Grinnell-Saunders Diaphragm Valves

Bodies
Screwed ends — ¼" thru 3"
Flanged ends — lined or unlined, ½" thru 18"
Butt weld ends — ½" thru 6"
Socket ends — ½" thru 4"

Angle Bodies
Screwed ends — ¼", ⅜", ½", ¾", 1¼", 2"
Flanged ends — ¾" thru 6".

Bonnets
Handwheel operated bonnet (available with rising stem, travel stops, extended stem, chainwheel, adapted for Tejax indicator)
Quick turn — lever operated bonnet, ½" thru 3"
Bendix-Westinghouse topworks
standard (air to close — spring to open)
Robotair, ¼" thru 1"
Rotochamber, 1" thru 4"; in tandem, 5", 6"
direct acting (spring to close — air to open)
Robotair, ¼" thru 1"
Rotochamber, 1" thru 4"
double acting (air to close — air to open)
Robotair, ¼" thru 1"
Rotochamber, 1" thru 4"
Piston operated, 6" thru 12"
Sliding stem bonnet, ½" thru 12"

Diaphragms
Natural rubber, neoprene, reinforced neoprene for vacuum, hycar, butyl, white gum rubber, Kel-F, Teflon, polyethylene.

Body Materials
Iron, bronze, stainless steel, cast steel, aluminum, monel, saran, durimet

Body Linings
Glass, lead, soft rubber, hard rubber, neoprene, saran

Bronze Beer Valves
Socket both ends
Socket end to flange end
Flange both ends
Socket end to male hose thread end
Flange end to male hose thread end
Male hose thread both ends

GRINNELL
WHENEVER PIPING IS INVOLVED

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

Nicholas John Mattick (1897–1954), tool engineer, Economy Pumps, Inc., Division, Hamilton-Thomas Corp., Hamilton, Ohio, died Feb. 8, 1954. Born, Cincinnati, Ohio, June 12, 1897. Education, ME certificate, Cincinnati University, 1925. Married Harriet Mattick, 1912. Mem. ASME, 1939.

Keep Your ASME Records Up to Date

ASME Secretary's office in New York depends on a master membership file to maintain contact with individual members. This file is referred to dozens of times every day as a source of information important to the Society and to the members involved. All other Society records and files are kept up to date by incorporating in them changes made in the master file.

From the master file are made the lists of members registered in the Professional Divisions. Many Divisions issue newsletters, notices of meetings, and other materials of specific interest to persons registered in these Divisions. If you wish to receive such information, you should be registered in the Divisions (no more than three) in which you are interested. Your membership card bears key letters opposite your address which indicate the Divisions in which you are registered. Consult the form on this page for the meaning of the letters. If you wish to change the Divisions in which you are registered, please notify the Secretary's office.

It is important to you and to the Society to be sure that your latest mailing address, business connection, and Professional Divisions' enrollment are correct. Please check whether you wish mail sent to home or office address.

For your convenience a form for reporting this information is printed on this page. Please use it to keep the master file up to date.

ASME Master-File Information

(Not for use of student members)

Please print **Check mailing address**

Name..... (Last, First, Middle)

Home address..... (Street, City, Zone, State) ☐

Name of employer.....

Address of employer..... (Street, City, Zone, State) ☐

Product or service of company.....

Title of position held.....

Nature of work done.....

I am a subscriber to (please check)

Publication	*Address changes effective when received prior to:*
☐ Mechanical Engineering	10th of preceding month
☐ Transactions of the ASME	20th of preceding month
☐ *Journal of Applied Mechanics*	20th of preceding month
☐ *Applied Mechanics Reviews*	1st of preceding month

Please register me in three Professional Divisions as checked:

☐ A—Aviation
☐ B—Applied Mechanics
☐ C—Management
☐ D—Materials Handling
☐ E—Oil and Gas Power
☐ F—Fuels
☐ G—Safety
☐ H—Hydraulics
☐ J—Metals Engineering
☐ K—Heat Transfer
☐ L—Process Industries
☐ M—Production Engineering
☐ N—Machine Design
☐ P—Petroleum
☐ R—Railroad
☐ S—Power
☐ T—Textile
☐ V—Gas Turbine Power
☐ W—Wood Industries
☐ Y—Rubber & Plastics
☐ Z—Instruments and Regulators

William Stark Newell (1878–1954), chairman of the board, Bath (Me.) Iron Works Corporation, died April 18, 1954. Born, Albany, N. Y., May 31, 1878. Parents, William C. and Ellen A. (Doane) Newell. Education, BS, Massachusetts Institute of Technology, 1899; hon. MS Bowdoin College; LLD, Colby College; DE, University of Maine; DE, Stevens Institute of Technology. Married Caroline E. Moulton, 1907 (died 1950). Mem. ASME, 1944. He introduced the construction basin—or "sunken bathtub"—method to commercial shipbuilding industry. He employed the idea in 1941 to build a large share of the Allies' "Bridge of Ships" across the Atlantic—74 destroyers for the U. S. Navy and 274 freighters for the United States and Great Britain. His work won him foreign as well as American recognition. In 1941 he was elected president of the Society of Naval Architects and Marine Engineers. He was also a life member of that society's counterpart in England. He was an honorary member of Societe de Chimie Industrielle of France; chairman, Maine Committee, American Branch, Newcomen Society of England. In 1946 he was honored by President Harry S. Truman and was selected as an official witness of the Navy at the atomic-bomb experiment at Bikini. In addition to two Presidential citations from the United States, he was named a Chevalier of the French Legion of Honor. He was a life member of the Corporation of M.I.T. and had been a trustee of Webb Institute and Colby College. Survived by a son, John R., and two daughters, Mrs. Paul Tiemers, Summit, N. J., and Mrs. Eastham Guild, Jr., Wellesley, Mass.

Casin Watson Obert (1876–1954), retired consulting engineer and pioneer in welding development, died April 16, 1954. His home was in Westport, Conn. Born, Unadilla, Mich., Oct. 9, 1876. Parents, Otis H. and Josephine (Watson) Obert. Education, ME, Columbia University; 1902. Married in 1899. Assoc. ASME, 1904, Mem. ASME, 1914. He served the Society as secretary of the Boiler Code Committee, 1912–1927. In 1927 he became honorary secretary of the Committee. As early as 1911 he came to ASME to aid in the preparation of the proposed new ASME Boiler Code. A veteran of more than 40 years in metal welding, his research after 1927 in the welding of boilers and other pressure tanks and vessels led the Society to approve his recommendations as a body of rules in this welding field. Survived by a daughter, Mrs. Marion O. Freeman, with whom he made his home.

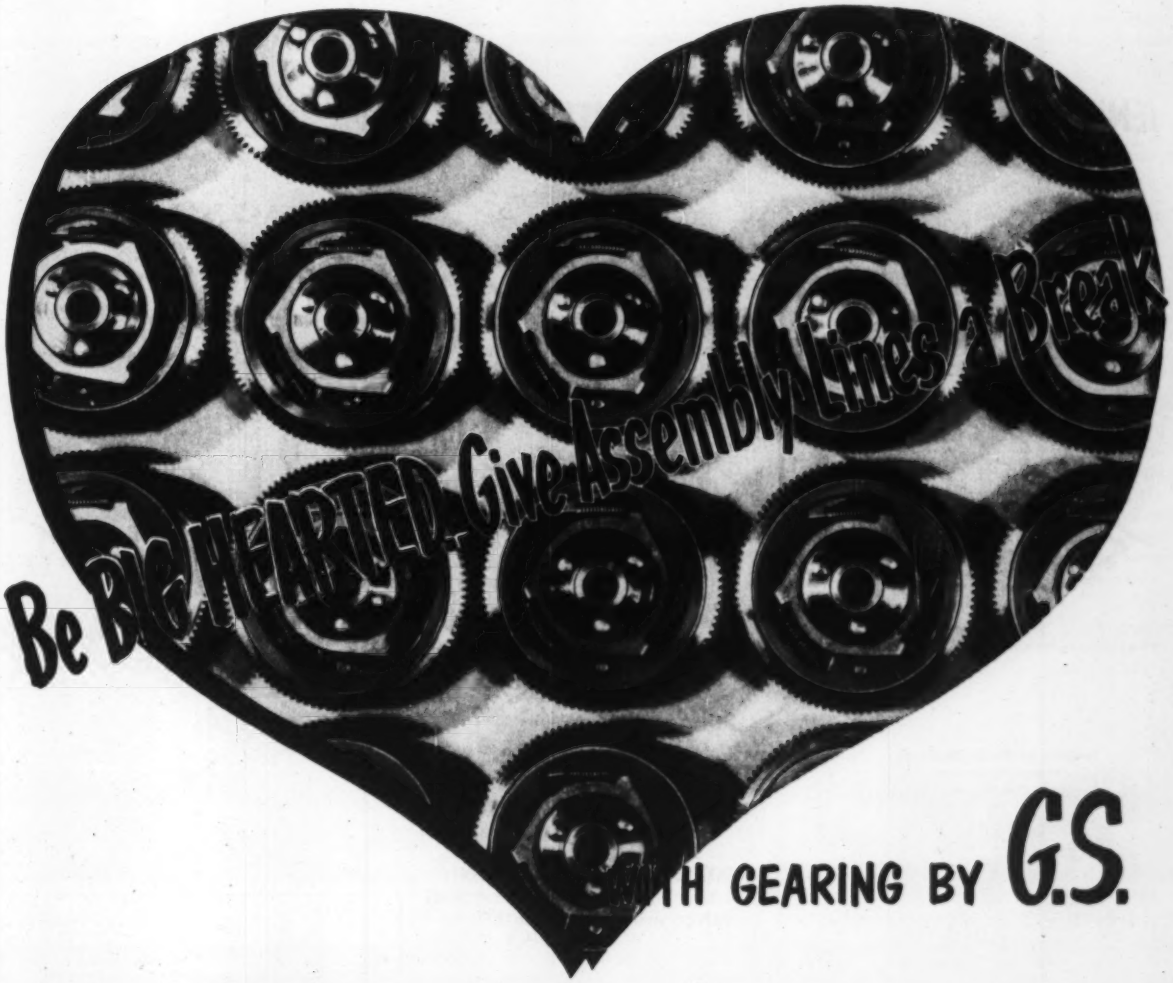
Arthur Preston Paine (1886–1954), associate director of research, Mergenthaler Linotype Co., died March 25, 1954. Born, Brooklyn, N. Y., Aug. 20, 1886. Parents, Arthur R. and Caroline A. (Price) Paine. Education, BA, Amherst College, 1908; postgraduate study, Pratt Institute. Married Florence M. Curtiss, 1923. Assoc-Mem. ASME, 1920; Mem. ASME, 1935. In recent years he had been actively concerned, among other things, with the development of the Ming Kwai typewriter, invented by Lin Yutang, for composition of Chinese characters. He held more than 20 U. S. and several foreign patents. Survived by wife and a son, Stephen C.

Chapin Roberts (1888–1954), consulting engineer, Carr & Wright, Inc., Chicago, Ill., died Feb. 11, 1954. Born, Oak Park, Ill., Aug. 13, 1888. Parents, C. E. and Cleantha J. Roberts. Education, BS, University of Wisconsin, 1911. Married Elizabeth White, 1920; children, Carolyn, David. Jun. ASME, 1914; Mem. ASME, 1921.

Clyde Benton Smith (1918–1954?), whose death was recently reported to the Society, was project engineer, Continental Can Co., Chicago, Ill. Born, Defiance, Ohio, Oct. 24, 1918. Education, BS(ME), Tri-State College, Angola, Ind., 1939. Mem. ASME, 1952.

Henry Sherriff Walker (1899–1954), vice-president, Insto-Gas Corp., Detroit, Mich., died recently, according to a notice received by the Society. Born, Detroit, Mich., Oct. 14, 1899. Parents, Henry C. and Margaret (Sherriff) Walker. Education, BME, University of Detroit, 1925; ME, 1945. Married Ruth D. Blakeslee, 1931; children, Henry S., Jr., Sally Elizabeth. Author of several papers on industrial research and technical reports. Assoc-Mem. ASME, 1930; Mem. ASME, 1935. He served the Society as chairman, Detroit Section, 1949-1950.

Joseph Stanley Wetherald (1892–1954), construction manager, Foster Wheeler Corp., Carteret, N. J., died Feb. 26, 1954. Born, Ashton, Md., Aug. 19, 1892. Education, BA, Swarthmore College, 1915; ME, 1921. Married Ruth Morey. Mem. ASME, 1946. He traveled extensively, supervising the construction of many of the largest oil refineries, steam generators, and chemical plants throughout the world. Survived by wife; two sons, S. Morey, Lt. (jg) USN, Richard T.; two brothers, Robert, Narberth, Pa., Harry, Buffalo, N. Y.; and two sisters, Dorothy and Mrs. Helen Moore, both of Sandy Spring, Md.



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See where and how we mass-manufacture Small Gearing to uniformly fine tolerances. This attractively printed 8½ x 11" 6-page folder is punched for ring-binder use. You'll want to keep it handy for frequent reference. It contains 23 pictures of Small Gears, plant views, as well as Diametral and Circular Pitch Tables. Ask for your copy on company stationery, please!

JENKINS PRACTICAL PIPING LAYOUTS 73

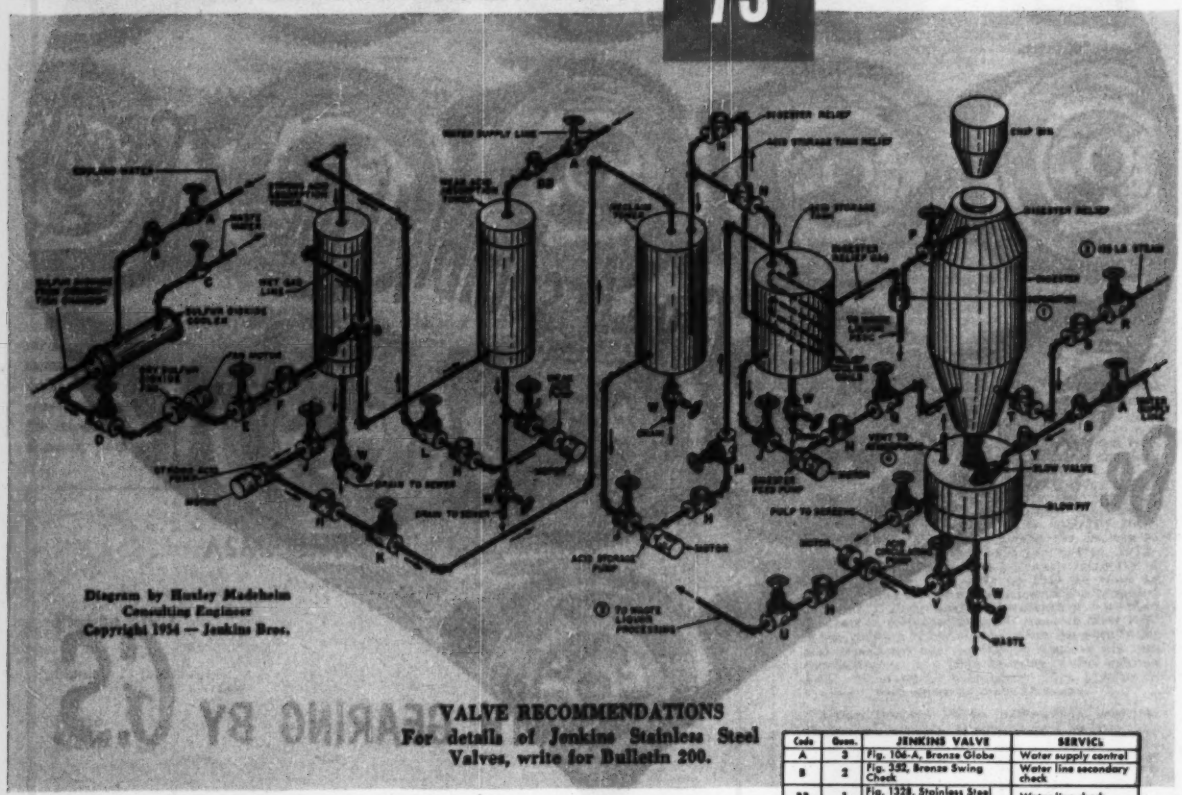

Diagram by Huxley Madeheim
Consulting Engineer
Copyright 1954 — Jenkins Bros.

VALVE RECOMMENDATIONS
For details of Jenkins Stainless Steel Valves, write for Bulletin 200.

Code	Quan.	JENKINS VALVE	SERVICE
A	3	Fig. 106-A, Bronze Globe	Water supply control
B	2	Fig. 592, Bronze Swing Check	Water line secondary check
BB	1	Fig. 1328, Stainless Steel Swing Check	Water line check
C	1	Fig. 47-U, Bronze Gate	Cooler water shutoff
D	1	Fig. 613, I.B.B.M. Globe	Sulfur dioxide fan control
E	1	Fig. 651-A, I.B.B.M. Gate	Gas shutoff
F	1	Fig. 1331, Stainless Steel Swing Check	Prevent strong acid backflow to SO_2 fan
G	1	Fig. 1307-A, Stainless Steel Gate	Gas shutoff
H	5	Fig. 1331, Stainless Steel Swing Check	Prevent backflow to pump
J	4	Fig. 1307-A, Stainless Steel Gate	Pump suction shutoff
K	1	Fig. 1317, Stainless Steel Globe	Strong acid pump discharge control
L	1	Fig. 1317, Stainless Steel Globe	Weak acid pump discharge control
M	1	Fig. 1317, Stainless Steel Globe	Acid storage pump discharge control
N	2	Fig. 1331, Stainless Steel Swing Check	Prevent gas backflow
P	1	Fig. 1307-A, Stainless Steel Gate	Digester relief control
Q	1	Fig. 1317, Stainless Steel Globe	Digester feed pump discharge control
R	1	Fig. 1046, Cast Steel Globe	Steam control valve
S	1	Fig. 1025, Cast Steel Swing Check	Steam line secondary check
T	1	Fig. 1331, Stainless Steel Swing Check	Prevent acid backflow
U	1	Fig. 1317, Stainless Steel Globe	Acid circulation pump discharge control
V	1	Fig. 1307-A, Stainless Steel Gate	Circulating pump shutoff
W	5	Fig. 1308, Stainless Steel Globe	Drain control
X	1	Fig. 1317, Stainless Steel Globe	Pulp discharge control
Y	1	Fig. 1328, Stainless Steel Swing Check	Prevent acid backflow

How to plan PIPING FOR ACID LIQUOR PREPARATION IN THE SULFITE PULPING PROCESS

The sulfite pulping process calls for a digester solution that is strongly acid. It is prepared by burning sulfur or pyrites to form sulfur dioxide, which is passed through absorption towers containing limestone and water. This produces an acid liquor consisting mainly of calcium bisulfite and sulfurous acid. The wood chips are cooked with this acid liquor at approximately 300°F, by steam admitted as indicated in the diagram.

Pressure is reduced by opening the digester relief valve when cooking is completed. The hot gases pass through the coils in the acid storage tank to preheat the liquor, then back to the reclaim tower where they go into solution. Next, the liquor and pulp are forced into the blow pit by the pressure remaining in the digester. The liquor is drained off and sent to waste, or is processed for by-products. Water, free of impurities which might contaminate the pulp, is then admitted to wash the pulp thoroughly. After this washing, the pulp passes onto screens and eventually to the paper making process.

Valves controlling the dry sulfur dioxide gas (prior to passing through an absorption tower) are iron body bronze mounted. Valves specified for the wet sulfur dioxide gas (after passing through an absorption tower) are stainless steel, because of the corrosive nature of the acid bearing gas. Valves in the liquor lines are Stainless Steel, Type 316, due to the corrosive combination of calcium bisulfite and sulfurous acid. Valves for water and steam lines are bronze, with the exception of the check valves marked "S" and "Y", which are stainless steel due to the possibility of acid liquor or gas backing up.

Consultation with accredited piping engineers and contractors is recommended when planning any piping installation.

To simplify planning, select all the valves you need from the complete Jenkins line. It's your best assurance of *lowest cost in the long run.* Jenkins Bros., 100 Park Ave., New York 17.

Complete description and enlarged diagram of this layout free on request. Includes additional detailed information.

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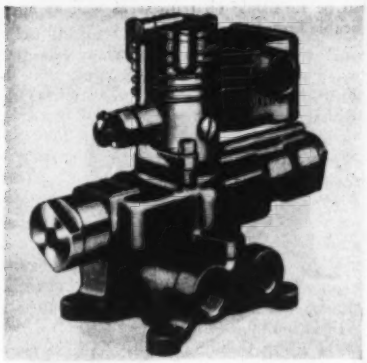
NEW EQUIPMENT | BUSINESS NOTES | LATEST CATALOGS

Available literature or information may be secured by writing direct to the manufacturer. Please mention MECHANICAL ENGINEERING

NEW EQUIPMENT

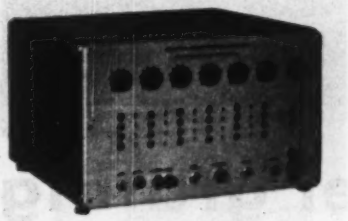


Pilot Operated Air Control Valve

Valvair Corp., 1009 Beardsley Ave., Akron 11, O., announces a new Speed King Solenoid pilot operated air control valve designed to meet the standards set by JIC. All parts are totally enclosed. The junction box for electrical control is cast integral with the housing of the pilot control unit. The company says the pilot can be mounted in two directions over the base and is universal to all assemblies. The base is cast bronze; the pilot valve, a zinc base alloy casting. The stem in the base and plunger in the solenoid are the only moving parts. Pressure range is from 35 to 200 psi for air and low pressure hydraulics. 2-, 3-, 4-, and 4-way-5-port (2-pressure) models with pipe sizes from $\frac{1}{4}$ in. through 1 in. are offered. Foot or subbase (manifold) mounting is optional in all sizes and models excepting the 4-way-5-port (2-pressure) valve. Any voltage and cycle can be accommodated.

10- and 20-Point Recorders

Two new electronic strip chart recording instruments designed to record 10 and 20 points have been introduced by the Industrial Division of Minneapolis-Honeywell Regulator Co. The new 20-point strip chart recorder yields 25 per cent more data than 16-point recorders without a proportionate increase in either size or maintenance expenses. The equipment is suited for installations where a quantity of information is required but where measurement is limited either by cost or space considerations.



Preset Interval Generator

A new model 564 preset interval generator, designed for testing and calibrating systems that rely on precise time measurements, has been announced by Potter Instrument Co., Inc., Great Neck, N. Y. Time intervals and delays from 1 microsecond to 1 second may be generated or measured, the company says. In generating an interval or delay, the desired number of microseconds is selected by means of six 10-position switches, one for each digit of the delay in microseconds. To measure an existing time interval, the instrument counts the exact number of pulses produced by a 1-mc crystal-controlled oscillator during the interval.

The 564 is a megacycle predetermined counter with a built-in time-base oscillator that uses a temperature-controlled 1-mc crystal for long term frequency stability. Indication is by means of neon lamps arranged to give six-digit readings directly in microseconds.

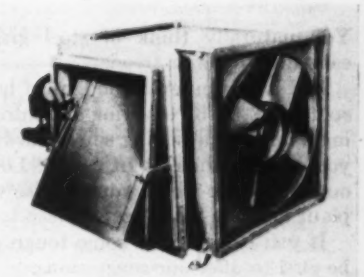
The company says many new circuits have been incorporated to make the 564 a versatile instrument for short time measurement and generation. Particularly new is the ability of the instrument to produce delays as small as 1 microsecond. Intervals of the order of seconds are generated with better than 0.0001 per cent accuracy. Manual or automatic reset may be used; with automatic resetting, the instrument recycles itself to produce trains of accurately-spaced pulses. A separate amplifier and shaper unit is provided for applications where an external time base source is used for simulating target delays selectable directly in feed or yards.

Ultrasonic Viscosimeter

The Ultrasonic Engineering Co. has announced an ultrasonic viscosimeter which features a rugged, sensitive probe without moving parts. It is said to provide instantaneous, accurate, and continuous measurement of viscosity.

Measurements are made by immersing the sensing element of the probe in a liquid. The instrument panel meter reads directly the solution viscosity in centipoises times density. This device, according to the manufacturer, makes possible continuous measurements of solution viscosities from zero to 100,000 centipoises or higher at room or elevated temperatures, and operation even under heavy pressures.

Three models are available. Full details may be obtained from the manufacturers, Ultrasonic Engineering Co., Box 46, Maywood, Ill.



Draft Inducer

L. J. Wing Mfg. Co., Linden, N. J., announces a new design of the Wing Furnace Draft Inducer, originally introduced in the 1920's. Main features of the new design include interchangeable side panels, moveable mounting feet, motor and fan assembly completely withdrawable, spring-mounted motor and V-belt drive to prevent mis-alignment, variable speed motor for precise draft control and pre-sealed bearings to eliminate periodic lubrication. It has a wide capacity range to loads of 100,000 lb per hr.

Pump Blocks of Polyvinyl Chloride

The availability of a new "V" Series of flex-i-liner pumps incorporating the use of unplasticized rigid polyvinyl chloride for the pump block has been announced by Vanton Pump & Equipment Corp., Empire State Bldg., New York, N.Y.

The unusual properties of PVC, particularly its relative inertness to chemical attack, makes it ideally suited for use as a pump housing, Vanton states. Because this rigid PVC is processed without plasticizers, the full utilization of the chemical inertness and inherent strength, lightweight, and toughness of the straight polyvinyl chloride resins is employed, according to the manufacturer.

Grating by BLAW-KNOX

what can steel grating do for you?

You naturally think of steel grating for floors, platforms, walkways, catwalks and stair treads.

But have you ever thought of how steel grating can make your danger spots safe . . . by covering an unprotected open pit or light well, by guarding a fan, by providing some sturdy shelving, or by serving some purpose you'd never thought of before. Look around your plant, both inside and outside, to see where you can use versatile steel grating . . . to make your plant an even better, safer place to work.

If you come across some tough problem on a grating application, we'll be glad to offer our suggestions.

Only Blaw-Knox Electroforged® Steel Grating and Stair Treads —have these five exclusive features:

1. rigid one-piece construction—easy to install
2. all surfaces accessible—easy to paint
3. no sharp corners to clog—self-cleaning
4. maximum open area—for light and ventilation
5. non-slip twisted crossbar—safe footing

A short note will bring you a copy of new Bulletin No. 2365-R —a dimensional sketch will bring you a quotation.

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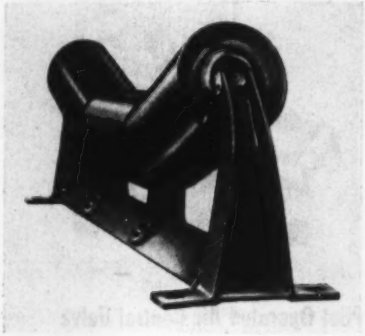
GRATING DEPARTMENT

GRATING APPLICATIONS: floors • platforms • walkways • catwalks • stair treads • fan guards • shelving • and many other uses, both outdoors and indoors, for versatile steel grating

KEEP INFORMED — NEW EQUIPMENT · BUSINESS NOTES · LATEST CATALOGS

Vanton Pumps are self-priming and do not contain stuffing boxes or shaft seals of any sort. The activating element is an eccentric shaft and rotor assembly which rotates inside the flex-i-liner. Molded flanges on the flex-i-liner straddle the body block and are pressed to its sides by end plates, sealing off the fluid passage.

Other body block materials of construction available are bakelite, polyethylene, lucite, Buna N hard rubber, and stainless steel. Flex-i-liners are available in natural or pure gum rubber, neoprene, Buna N, hycar, silicone, and compar. Capacities from 1/3 to 20 gpm are attained with pressures up to 60 psi and vacuum to 26 in. Hg. Recommendations for specific applications will be furnished on request as well as applicable literature.



Belt Idlers

Jeffrey Mfg. Co., Columbus, Ohio, has announced the introduction of its latest MD and HD Series Belt Idlers with the new Duoflex seal.

The company claims this idler offers many features long desired by belt conveyor users. It is said to be as nearly perfectly balanced in design and construction as is possible.

The dual flexible contact seals, according to laboratory and field reports, perform the double function of keeping out dirt and retaining the grease for practically an endless period of time. The idler is factory packed, adjusted and sealed, to create a permanently lubricated idler, the company says. However, the design of the idler permits re-greasing.

Valve Chart

A new valve comparison chart, listing valve figure numbers of 15 major manufacturers and the OIC equivalent valve figure numbers, has been released by The Ohio Injector Co., Wadsworth, Ohio. The chart compares gate, globe, check, and angle valves in bronze, iron cast steel and forged steel. Only gate valves are presented in the stainless steel line. Lubricated plug valve comparisons include those made of cast steel and cast iron.

KEEP INFORMED

NEW EQUIPMENT
BUSINESS NOTES
LATEST CATALOGS

Medium-Capacity Straddle Carrier

A new field-tested medium capacity Ross straddle carrier, designed especially for general plant materials handling applications, is now available from the Clark Equipment Co., Battle Creek, Mich. The 20,000-lb capacity machine, designated as the Ross Carrier Series 81, replaces the former Series 80 carrier. Outstanding features claimed for this fully hydraulic machine include increased speed of operation, improved accessibility for maintenance and excellent drive visibility.

The company says the operator's load hook visibility has been greatly improved by a larger opening in the frame and a window below the windshield, and the cab itself has been made larger for greater operator comfort. Greatly improved visibility over the right side of the machine was obtained by changing the location of the transmission and engine, it is said. Quick accessibility to all working parts of the superstructure, including all parts of the engine and hydraulic system, is made possible by removable compartmentalized covers.

Operation of the hydraulic hook swing has been accelerated and the load hoisting speed has been increased from 18 to approximately 35 feet per minute, substantially increasing overall handling capacity per unit of time, according to the company. The standard power plant for the Ross Series 81 is a Hercules engine, a 6-cylinder 221-cubic inch truck-type engine, with a Ford V-8 239-cubic inch engine available as optional equipment at no extra cost. Hydraulic steering and an all-steel operator's cab are optional equipment.

New Hardfacing Rod

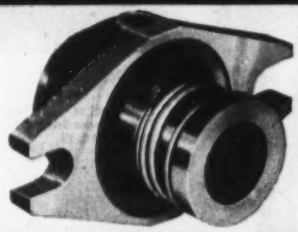
A new hardfacing rod developed specifically to withstand the combination of extreme abrasion and very heavy impact has been announced by Mir-O-Col Alloy Co.

The new rod, named "BR," is available for either electric or acetylene application. An outstanding characteristic of the rod is its multiple pass feature, the company says. Worn parts originally rebuilt with "BR" can be rebuilt over and over again with the new metal forming a permanent bond with the previous deposit of "BR," it is claimed. A free sample of the new Mir-O-Col "BR" rod, along with informative literature, may be obtained by writing to Mir-O-Col Alloy Co., 312 North Ave. 21, Los Angeles 31, Calif.

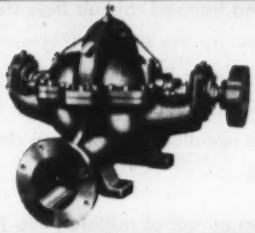
What's NEW in pumps from ?

PEERLESS PUMPS

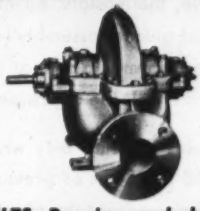
THIS MECHANICAL SEAL...



APPLIED TO THIS PUMP...



PRODUCED THIS NEW PUMP



RESULTS: Bearing and shaft wear reduced; space and weight halved

NEW PUMP DESIGNED AROUND MECHANICAL SHAFT SEALS MAKES PUMP MAINTENANCE EASIER AND PREVENTS TROUBLESOME PACKING LEAKS.

AVAILABLE FROM PEERLESS on all types, from Swimming Pool pumps to pumps handling Hydrocarbons at 250° F.

Peerless Pumps manufactures many types of pumps with mechanical shaft seals. They replace packing and packing boxes in many new Peerless pump designs. An example of a shaft seal application is shown at the left. When a conventional horizontal centrifugal, split case pump was redesigned, with shaft seals replacing the packing chamber, space and weight, in the same pump sizes, was *nearly cut in half!* In addition, bearing wear was measurably lessened because of the decreased deflection of the shorter shaft. Mechanical shaft seals are now available in many Peerless horizontal and vertical pumps. Peerless pumps designed around mechanical shaft seals are increasingly popular because they cut maintenance costs, improve appearance and often save considerable space and weight.

MAIL COUPON FOR COMPLETE INFORMATION

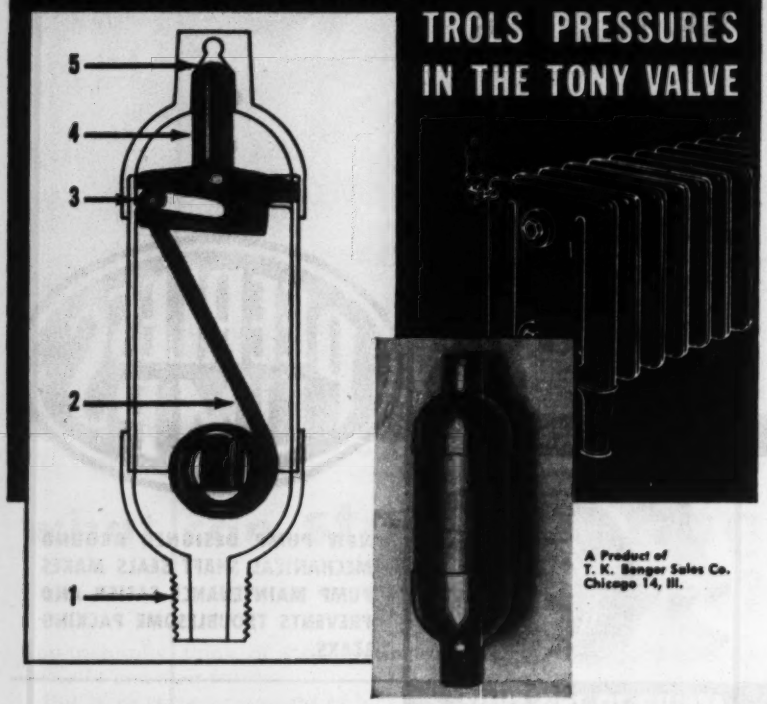
8-page bulletin describes the new Peerless split-case horizontal centrifugal pump illustrated above. Use coupon for your copy.

PEERLESS PUMP DIVISION
Food Machinery and Chemical Corp.
Plants: Indianapolis, Indiana; Los Angeles, California
Offices: New York; Indianapolis; Chicago; St. Louis; Atlanta; Dallas, Plainview and Lubbock, Texas; Albuquerque; Phoenix; Fresno; Los Angeles.

PEERLESS PUMP DIVISION
Food Machinery and Chemical Corporation
301 West Avenue 26, Los Angeles 31, California
Send Peerless Type AS Centrifugal Pump Bulletin No. B-1350

NAME_____
COMPANY_____
ADDRESS_____
CITY_____ STATE_____
ME

HOW CHACE THERMOSTATIC BIMETAL CONTROLS PRESSURES IN THE TONY VALVE



A Product of
T. K. Benger Sales Co.
Chicago 14, Ill.

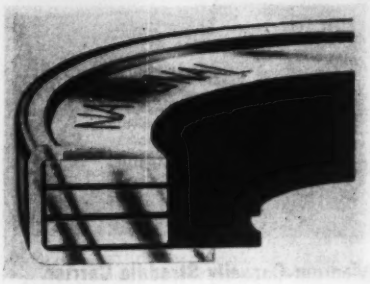
One of the age-old problems of releasing trapped cold air from steam radiators has been solved in the Tony Valve by the use of Thermostatic Control rather than by relying on pressure to actuate the venting mechanism. By using a coil of Chace Thermostatic Bimetal, the vent remains open until the heated steam travels the full length of the radiator and only then closes, after all of the trapped cold air has escaped.

In operation, the pressure of steam forces air out of radiator, into Tony Valve at fitting (1), through body of valve and out at (5). After cold air is completely exhausted and heat enters body of valve, thermostatic bimetal element (2) bends, moving pin (3) to left in slot in arm of plunger assembly (4). As left end of arm is locked in body, plunger is forced down into seat at (5) closing vent and sealing radiator and valve against further release of pressure.

This simple, positive and trouble-free unit releases pressure only when cold and closes only when warm to eliminate the old problems of pressure operated valves. All parts of the Tony Valve are of brass except the bimetal element.

This is but one of the many uses of Chace Thermostatic Bimetal in controls and recording apparatus. If you are interested in temperature responsive devices, read "Successful Applications of Chace Thermostatic Bimetal". Write today for this 36-page booklet which contains applications and 10 pages of engineering data on thermostatic bimetal.

W. M. CHACE CO.
Thermostatic Bimetal
1619 BEARD AVE DETROIT 9 MICH



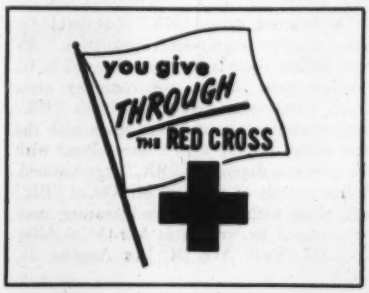
New Design Oil Seal

A new type of shaft seal for protecting bearings of agricultural and other heavy duty equipment has been announced by National Motor Bearing Co., Inc., Redwood City, Cal. The new seal is said to be extremely simple in design and easy to install. It is called the National Triple-Lip Syntech seal, and employs three identical sealing lips of synthetic rubber bonded to steel washers and enclosed in a rigid steel outer case. Use of these thin synthetic rubber sealing lips are said to keep seal torque low, simplify flush lubrication, and enable the seal to handle large amounts of shaft runout and misalignment. In tests, the seals have run repeatedly more than 4,000 hours—equivalent to 13 years in agricultural equipment—under a heavy head of sand and dirt, the company says.

Germanium Diodes

The addition of Type IN series germanium diodes to its product line has been announced by the International Resistance Co., 401 N. Broad St., Philadelphia 18, Pa. The diodes are specially designed to form a functional hexagonal body with an added taper feature to indicate direction of current flow. They are said to insure a low cost unit offering dependable service and long life.

Type IN series germanium diodes are protected against humidity by a brown, molded housing, and are aided by an electrically inert material which fills the entire cavity and seals out all moisture to withstand more severe mechanical shock, the company says. The diodes are available in 19 standard types, and are said to be adaptable to a large variety of circuit applications in electronic equipment.



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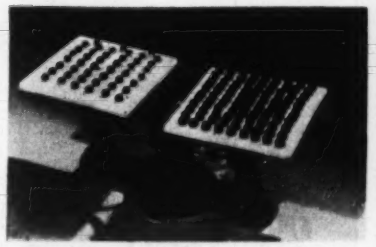
NEW EQUIPMENT
BUSINESS NOTES
LATEST CATALOGS



Lightweight Fasteners

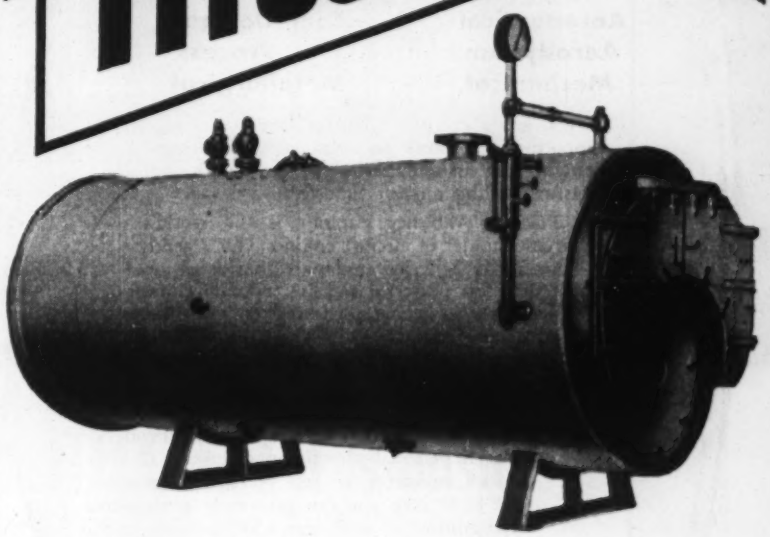
Four new lightweight lines of Elastic Stop nuts have been introduced by Elastic Stop Nut Corporation of America, Union, N. J., to offer designers an opportunity for weight savings throughout the whole range of aircraft locknut applications. The four new lines cover almost all aircraft locknut requirements in small and large sizes; hex, anchor, and gang channel nuts; in all temperature ranges from −70 to 1200 F. The company says the new nuts will be used in assembling basic aircraft structure; attaching components such as carburetors or pumps; parts such as access panels; and in assembling and attaching accessories such as armament, electronic gear, and bombsights.

Weight reductions are said to be from 0.5 to 2.5 pounds per 100 nuts. The new lines are: (1) Blue J type Elastic Stop nuts made of high strength aluminum alloy, which meet AN tensile strength requirements for steel nuts of the same thread size; (2) Type Y Elastic Stop nuts, which because of their 12-point (double-hex) design can be smaller and lighter than regular hex nuts with no sacrifice in strength; (3) Type LH Elastic Stop nuts, a new all-metal locknut design for use up to 550 F meeting the same AN specifications as ESNA's equivalent beam-type nuts; and (4) ZA1W Elastic Stop nuts in types for service up to 800 F and up to 1200 F, a new anchor nut design meeting the same AN high temperature specifications as existing anchor nuts, with cost and weight reduced. In addition, a new, lighter floating anchor nut designated A401, with reduced envelope dimensions, has also been made available in the Blue J and LH lines.

Siphon for Photocopy Machines

A siphon for emptying the processing solution from dry-process office photocopy machines is now being offered by distributors of Peerless Photo Products, Inc., Shoreham, L. I., N. Y. The siphon consists of a length of flexible rubber hose having a glass or plastic tip on one end fitted with a spring clip to secure it to the tray or tank so that the siphon need not be held in place while the solution is emptying, and at the other end a rubber stopper and a rubber suction bulb. The processing solution can be quickly siphoned off from the machine into an amber-colored glass or polyethylene bottle, available in several different sizes to match the volume of the tank.

IN BOILERS—
"Scotch"
MEANS
TITUSVILLE



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OF SCOTCH MARINE BOILERS
FOR POWER AND HEAT

When you want the ultimate in boiler economy and durability, go "Scotch" and say "TITUSVILLE." We have built more Scotch Marine Boilers than any single manufacturer, are the largest builders, and have contributed improvements and refinements to this basic type for over 90 years. *Let us send you our Scotch Marine Bulletins—factual, complete!*

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If you are a creative engineer here is a real opportunity to work on stimulating, full-time engineering assignments — to grow with the fast-expanding aircraft industry.

Pratt & Whitney Aircraft is the world's largest builder of aircraft engines. Our recently announced J-57 jet engine is considered one of the most powerful and best ever developed. Yet even so we are working on even more advanced engines — jet, turboprop, ramjet, nuclear.

To develop these engines is one of the most difficult assignments facing any technical group anywhere. But for that very reason it offers unusual personal growth opportunities to ambitious engineers — you perhaps. If you are the *right* man you can gain early professional recognition — work into a key position in this big engineering development organization.

This is a real opportunity to build a secure engineering future. Why not send a complete resume today to Mr. Paul Smith, Employment Dept. ME 7.

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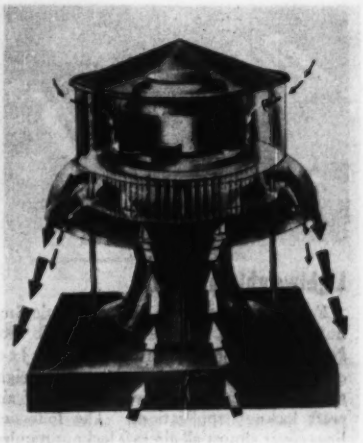
Division of United Aircraft Corporation
East Hartford 8, Connecticut



Low-Silhouette Exhauster

Gallaher Co., Omaha, Nebr., has a power exhauster model built around a Fairbanks-Morse axial air-gap motor said to be lighter in weight, higher in efficiency, and provide better safety protection and greater mechanical strength. The new unit, called "Air-Van," cuts as much as 200 lb. and 18 in. off older model power exhausters by utilizing the space and weight saving advantages of the motor, according to Fairbanks, Morse & Co. The new Gallaher Air-Vans range in capacity from 150 to 12,000 CFM and in horsepower from $^1/_{30}$ to 5 hp, all sizes above $^3/_4$ hp being equipped with pancake motors. The largest power exhauster in the line, the 12,000 CFM, 5 hp unit, measures 31 to 38 in. in height and is low enough to be concealed by an average roof-top parapet.

The Air-Van has a positive air seal-off which in most installations prevents the collection of chemical fumes or moisture in the motor chamber and eliminates the possibility of corrosion or explosion, the company says. This seal-off is accomplished by the action of the squirrel-cage fan, located immediately below the chamber, which draws a current of fresh air down through the motor hood and over the motor and motor shaft, thus sealing the chamber off from the main air flow below during operation and preventing any fumes, vapor or gases from reaching the motor.

Pumping Control

Federal Electric Products Co., 50 Paris St., Newark, N. J., is now producing a complete new line of both single phase and three phase oil well pumping control, designed for across-the-line starting of squirrel cage motors used to drive oil well and other types of pumps. The company says the control consists of Federal "Noark" starter with overload protection, and a selector switch together with an undervoltage relay and a lightning arrestor. A motor-driven 24 hr time switch is said to permit definite time operation of automatic pumping cycles.

Disconnecting means and short circuit protection of the starter, motor, and wiring on the load side are said to be provided either by the Federal "Noark" Type AB circuit breaker or the Federal "Noark" Type A heavy-duty, front operated fusible safety switch. All equipment is mounted in a raintight enclosure on a removable steel back plate.

New Belt Drive

A newly developed V-belt drive arrangement for broadening the spindle speed range and versatility of its standard air-hydraulic drill units has been introduced by the Drill Unit Division of Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh, Pa.

The new accessory includes cast iron pulley guards and a motor plate which accommodates standard NEMA rigid-mounted motors, the company says. This drive arrangement is said to bring the unit into complete compliance with Joint Industrial Commission machine building specifications. Using standard four-step dynamically balanced pulleys, the accessory makes it possible to obtain 24 different spindle speeds. With an 1,800 rpm motor, the range is 590 to 5,000 rpm; with a 3,450 r.p.m. motor, it is 1180 to 10,000 rpm.

Casting Release Agent

Two silicone release agents have been developed by Dow Corning Corp., Midland, Mich., for shell molders who wish to use solvent-type agents rather than water emulsions. Identified as F-496 and F-452, they contain 5 per cent and 50 per cent solids, respectively, of high-viscosity silicone fluids in mineral spirits.

Designed especially for use on deep-draw, narrow-draft patterns, these new silicone parting agents are claimed to leave minimum build-up, ease pattern cleaning, and provide multiple releases. A single application of F-496 will release up to 15 shells, the company says.

While F-496 is designed for immediate use, F-452 is available for those who may wish to make up concentrations to meet their own specific operating requirements. Dilutible in mineral spirits, it will not separate in storage after dilution, according to Dow engineers.

Further information on these materials is given in Data Sheet 5-106, obtainable on request.

When you're looking for a material that reduces NOISE...

micarta® is basic!

MICARTA's resilient structure "shushes" noise because it "soaks up" impact and vibration. MICARTA offers high compressive and flexural strength, too. It repels moisture . . . fights corrosion . . . endures heat and cold . . . wears slowly, evenly. How can this amazing material, that does so many jobs better than metal, serve you? Use the coupon for the complete story. J-06582

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In aviation for example MICARTA is serving in applications like pulleys, structural members and landing gear bushings.

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MICARTA Division, Attention: L. A. Pedley

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☐ Please have your representative call
☐ Please send me complete facts on MICARTA

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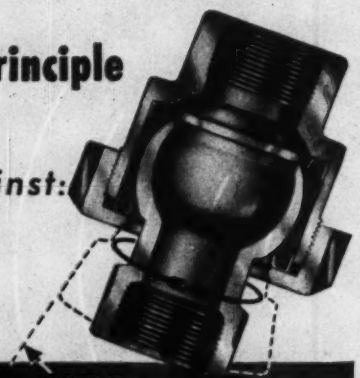
An ENGINEERING Principle

—protects piping connections against:

1. Expansion—Contraction
2. Vibration—Shock
3. Pump Pressure Surges



BARCO

Flexible
BALL JOINTS

1. **VERSATILE.** Barco Ball Joints solve many piping problems where flexible connections are needed to allow for movement, overcome misalignment, and guard piping against vibration, strain or shock.
2. **MAXIMUM FLEXIBILITY.** Up to 40° side flexibility with 360° rotating movement.
3. **MANY STYLES AVAILABLE.** Angle or straight; threaded or flanged connections. For pressures to 7,500 psi; temperatures to 1000°F. 15 different sizes, ¼" to 12".
4. **CHOICE OF MATERIALS.** Built to meet service requirements for steam, oil, gasoline, water, chemicals, and other fluids.
5. **ENGINEERING RECOMMENDATIONS.** Barco will be glad to send you complete information—ASK FOR BULLETIN No. 215.

● *Nothing Moves Like a Ball!* is an old engineering principle but there is nothing old about the use of 3" Barco Ball Joints, as shown in the above picture. This is the newest, most successful, most economical method of protecting connections to modern, high capacity refinery pumps against *Hydraulic Shock Loads*, vibration, and expansion.

Equally modern is the use of the two big 6" joints on the main tank piping to protect expensive valves against (1) pipe expansion and contraction, (2) possible earth shock, and (3) tank settling.

Barco Ball Joints have proved to be without equal for this kind of service. They are blow-out-proof, fireproof — simple and rugged. They require no lubrication and minimum maintenance.

We will be glad to send you complete information about Barco Ball Joints and how to use them. *Worldwide Sales and Service.*

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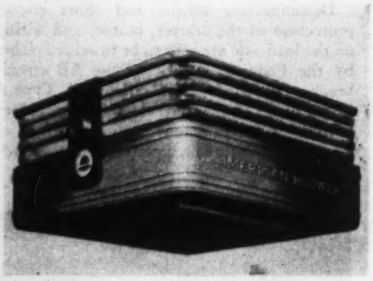


Unit Heaters

The American Blower Corp., Detroit 32, Mich., announces a new and completely redesigned line of unit heaters for steam or hot water operation.

The heaters are built in both the horizontal and vertical types in a wide range of sizes for industrial or commercial application. They are said to operate quietly and are tested and rated in accordance with the Standard Test Codes adopted jointly by the Industrial Unit Heater Association and the American Society of Heating and Ventilating Engineers. Descriptive literature may be obtained by writing for Bulletin 7517.

Position Servo Actuator

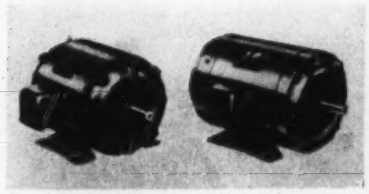
Torque-to-inertia ratio of 200,000 rad/sec^2 coupled with an acceleration time constant of 10 milliseconds are features of a new position servo actuator now under production at Summers Gyroscope Co., Santa Monica, Calif.

The servo, model 205, is offered in basic versions for piloted and pilotless aircraft. Each version contains a drive motor, radio noise suppression network, low inertia precision gear train, and a followup potentiometer. The piloted model contains an overload and disconnect clutch, and the pilotless model an overload clutch. These elements are housed in a sealed, waterproof case 5 3/4 in. × 3 3/4 in. that weighs but 4 3/4 lb for the piloted model and 4 1/4 lb for the pilotless version. Output capstan of the instrument is free to rotate 360 deg.

Metalworking Machines

Faster, more economical ways to form and fabricate material through the use of Di-Acro Precision Metalworking Machines is described and illustrated in a new eight-page booklet available upon request from O'Neil-Irwin Mfg. Co., 569 Eighth Ave., Lake City, Minn.

According to the company, the booklet, entitled "Quick Facts To Aid in Selecting Die-Less Duplicating Equipment," gives a concise summary on both hand and power operated Di-Acro benders, brakes, notchers, punch presses, rod parters, rollers and shears, and briefly explains how they duplicate parts to die accuracy without expense and time delay of making special dies. Specifications and capacities on 42 Di-Acro models are listed in table form.



Polyphase AC Motors

Howell Electric Motors Co., Howell, Mich., has announced a new line of Series 100 re-rated polyphase ac motors in the 1 to 30 hp class. The motors are built to new frame-size to horsepower standards set by NEMA. They are smaller and lighter than present motors, and in some models the horsepower is double that formerly available in frames of the same size, the company says. Frames are made of rolled steel, and end plates are of cast iron. The company says nearly 50% more contact area between cooling air and active materials assures maximum ventilation. Time-tested copper rotor construction has been retained. The first motors offered in the new series line are open, drip-proof motors, and totally enclosed, fan-cooled motors. Both types are available in 182 and 184 frame sizes, rated at: 1, $1^1/_2$ and 2 hp at 1800 rpm; $1^1/_2$, 2 and 3 hp at 3600 rpm; and $^3/_4$, 1, $1^1/_2$ hp at 1200 rpm.

Gas-Fired Warm-Air Space Heaters

The Heating Dept., Machinery Div., Dravo Corp., 1203 Dravo Bldg., Pittsburgh 22, Pa., has announced the addition of two gas-fired warm-air space heaters to supplement its line of *Paraflo* oil-fired heaters. They are the Model 20-G, with a capacity of 200,000 Btu per hr, and the Model 25-G, with a capacity of 250,000 Btu per hr. The new units are suitable for natural, manufactured, or mixed gases, and liquified petroleum, the manufacturer says.

The self-contained, gun-type, flange-mounted gas burner incorporates a combustion air fan driven by a $^1/_4$ hp resilient-mounted motor. It operates on 110-v, 60-cycle, single-phase power and is equipped with a thermo-electric safety pilot.

The new units now give Dravo a line of oil- and gas-fired space heaters ranging from 200,000 to 2,000,000 Btu per hr.

The air circulating fan takes in air at floor level, directs it around the combustion chamber, through the convector section, and out through two 12 × 12-in. directional nozzles. The nozzles can be rotated 360 deg. The high-velocity overhead discharge air will warm areas up to 90 ft from the unit without creating uncomfortable drafts, the manufacturer claims. The unit can be connected into duct systems, and the fan can be used in summer for ventilation.

For Consulting Engineers
Turn to Page 104

EYE-HYEs on your panel...
safe, sure check on water levels

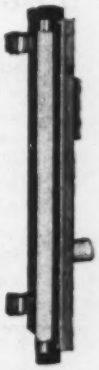
The Reliance-made Hydrostatic Remote Reading Boiler Gage

Easy to Install • Easy to Read • Easy to Maintain

Read your boiler water levels easily, quickly, accurately. Read them *conveniently,* right before your eyes, on panel or wall. You'll read them *oftener* and have better water level supervision. The bright green indicating fluid duplicates the water in your drum gage.

EYE-HYE is simple, safe, sure. It's sensitive to slightest level changes. Has no mechanical parts — is completely hydrostatic. You can blow it down — and should, at intervals, according to instructions. Otherwise practically no maintenance. Models available for pressures to 2500 psi.

Thousands of users have "repeated" — have ordered EYE-HYEs for new boilers, tanks, heaters, etc. Get the full basic story — write for Bulletin CO.



New Illumination for EYE-HYE ▶

EYE-HYE has always been self-illuminated, with incandescent lamps. *Now* a fluorescent tube assures even lighting the entire length of the gage window. The fluorescent unit is available separately for installation in all but very old EYE-HYE models in use. Write for prices — mention the model number on name plate.

THE RELIANCE GAUGE COLUMN CO. • 5902 Carnegie Avenue, Cleveland 3, Ohio

JUST PUBLISHED

the second volume of the ASME Handbook.
Sponsored by the Metals Engineering Handbook Board of The American Society of Mechanical Engineers.

Metals Properties

7½ x 10 445 Pages $11.00

In this handy reference is a practical accumulation of tabular working data on the properties of more than 500 metals in common industrial use—AISI steels, ASTM steels, cast copper alloys, aluminum alloys, tin, magnesium, etc.

Specifically prepared for design engineers, this book provides such information as chemical composition...industrial uses...density, electrical resistivity, volume conductivity, and other physical properties...draw temperatures, tensile strength, yield point and other mechanical properties...treatment temperatures for forging, annealing, normalizing and quenching...thermal conductivity...critical points...end-quench hardenability...Rockwell "C" core hardness...hot working temperature...weldability...fatigue strength...coefficient of thermal expansion...brazing and soldering.

In brief, **METALS PROPERTIES** is the reference manual that will help you select the right metal for each part or product, see that it meets specifications, and make sure it will stand up under typical conditions.

Other titles of the 4-volume ASME Handbook

Available

METALS ENGINEERING-DESIGN—Well known authorities discuss such subjects as potential weaknesses of various metals and ways of making the metal strong, corrosion and the mechanical factors which influence corrosion, testing by nondestructive methods, surface finish requirements in design, and design procedures which embrace practice and theory, stress and strength, elements of theory of elasticity, theories of failure, working stresses, etc.

In Preparation

ENGINEERING TABLES — METALS ENGINEERING-PROCESSES

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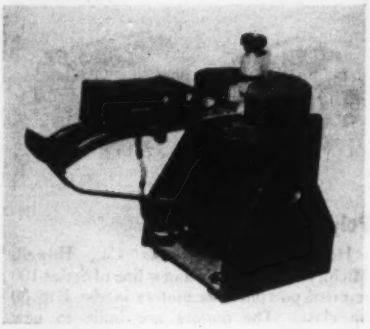


Vibration Exciter

A small, new shaker that vibrates at frequencies up to 10,000 cps for production vibration testing of sub-miniature electron tubes has been announced by the MB Mfg. Co., New Haven, Conn.

This electromagnetic equipment provides for rigidly clamping tubes in the vibrating armature, and includes a flat-top table for use in calibrating small vibration pickups and accelerometers. Accessory equipment supplied includes an electronic amplifier, power and field supply, and oscillator, all of which are specially designed to meet the requirements of high-frequency excitation, the company says. Performance specifications show that ratio of table acceleration to input voltage is flat within 15% from 200 to 10,000 cps. with a tube load of 3 grams. At such load, the exciter will deliver a 10g acceleration. Distortion of output wave form is said to be less than 3%.

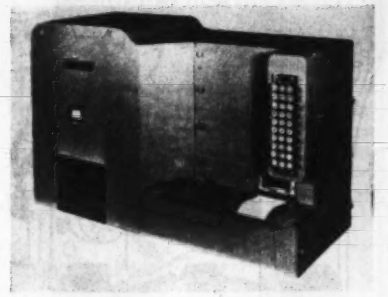
Angle Irons

The Taft-Peirce Mfg., Co. has announced the addition of Multiplex Angle Irons to its line of precision toolroom and inspection equipment. The Multiplex is a new general-purpose iron, made of cast iron, normalized, and having all surfaces scraped for accurate flatness and squareness.

A standard model, 12 in. long, 12 in. wide, and 12 in. high, can be furnished from stock. The plain surface measures 9 in. by 12 in., and the working surface at right angles is 10 in. by 12 in. Holes and slots provide for clamp bolts, and four tapped holes accommodate eye-bolts for ease of handling. Two recessed lips in the base section offer means of clamping the tool to machine or inspection tables.

Both the base section and the angle section are ribbed to ensure rigidity. All working surfaces are claimed square within 0.0005 in. in 6 in. and parallelism of the respective sides is held to a tolerance of 0.0005 in.

Each iron weighs approximately 95 lb. Price of the standard Multiplex Angle Iron is $240.00. Special sizes will be manufactured to specifications. More information will be supplied by the Taft-Peirce Mfg. Co., Woonsocket, R. I.



Digital Printer

A digital printer, which takes signals from Baldwin SR-4 resistance wire strain gage devices that are used in sensing forces, weights, pressures, and torque, is announced by Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.

Three or four digits can be printed on continuous tape, tickets, or sheets up to 8½ × 11 in. with or without carbons. Printing can be manually actuated or automatic at a preset interval. The company says operaton is by a rugged automatic null balance electrical system. The printer is applicable for either industrial weighing or making laboratory records of load and pressure measurements with equipment incorporating SR-4 devices such as load cells or pressure cells. In commercial use or industrial plant service it can print weights in any units on shipping memos, receiving reports, or other similar record sheets, the company says.

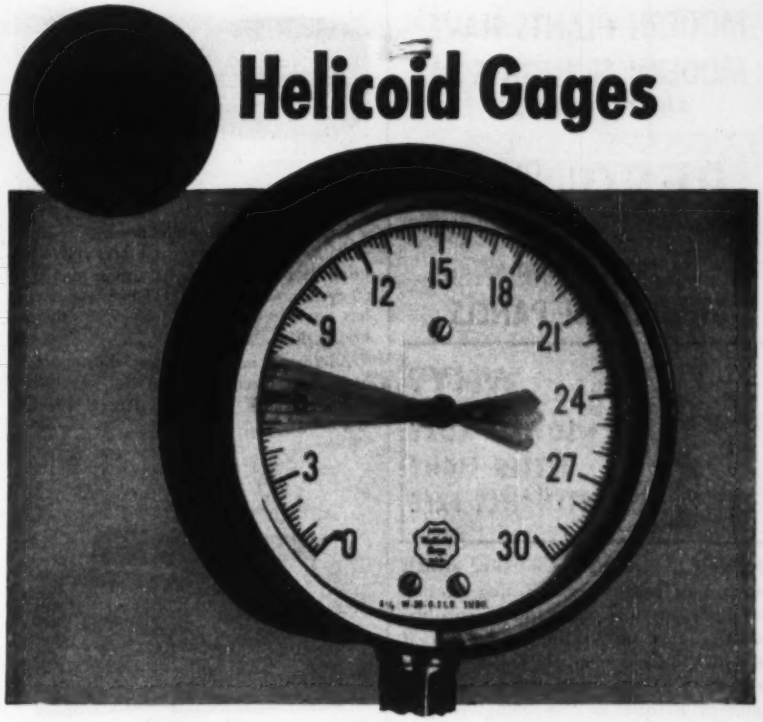
Printer records can be made and read by untrained personnel without the possibility of misreading dials or charts. However, one model is available with a 24-in. indicating dial having 1000 divisions. Typical system accuracy is within plus or minus 0.2% with a readability and sensitivity to 0.1% for the single interval model. Higher accuracies are obtainable. Standard response speed is 12 or 24 seconds but can be faster if specified. Identification keys for figures or letters are optional. Time, day, month and year can also be printed, either manually or automatically.

Recording Controllers

A line of process instruments including potentiometric and a-c bridge recorders and recording controllers has been announced by the General Electric Co.'s Meter & Instrument Dept., Schenectady 5, N. Y.

The instruments, designed for continuous measurement and control uninterrupted by periodic standardization, incorporate new measurement circuitry and components, according to company engineers. Foremost among the new features are a magnetic standard in the potentiometric system and a bridge-balancing unit in the a-c bridge system.

Both models are available with either electric or pneumatic control, and are equipped with a centerless pointer.



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Bourdon tubes in HELICOID Gages give maximum torque and minimum stress to promote greatest possible endurance life. Will withstand millions of pressure pulsations without stretching, leaking or cracking.

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Skylights of Resolite are installed at half the cost of conventional glazing because Resolite nests with all standard corrugations; requires no framing or flashing. It rests on the same members, is fastened the same way as the metal sheets. Sidewall lights of Resolite in non-corrugated construction need no expensive sash, simple angle girts give full support.

Shatterproof, structurally rugged, inert to usual industrial fumes, Resolite has unlimited life without protective treatment or maintenance. It is a quality product composed of stable polyester resins, reinforced with a *two-ounce* Fiberglas mat. It can be sawed, nailed, bolted and installed with ordinary tools by unskilled workers.

Flat sheets for sash are factory-cut to size. They are installed like glass.

The pictures above show the even distribution of daylight obtained in a building skylighted and glazed with Resolite. Its diffused light gives workers greater visual comfort . . . cuts artificial light costs. See why more and more nationally known industries are using Resolite for modern plant daylighting.

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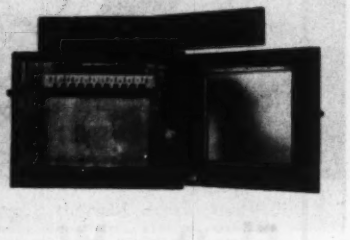
Chart speeds are 1, 4, 8, 12, and 24 hrs, and 7 days.

Net weight of the products varies from 75 to 95 lb according to control form and measuring system. The units utilize a 120-v, 60-cycle power supply. The potentiometer has a power consumption of 65 w; the a-c bridge, 40 w.

Additional information on the recording controllers is contained in Bulletin GED-2100, available from the General Electric Co.



Recording Instruments

Records from SR-4 strain gages at 50 points can be taken continuously and automatically in a total of 30 to 90 seconds with new Baldwin SR-4 strain scanning and recording instruments announced by Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.

The recorder provides three ranges of measurement: 0–2000, 0–5000, and 0–10,000 micro-inches and can handle gages with mixed resistances ranging from 60 to 500 ohms. A gage factor control is included to accommodate strain gages with gage factors ranging from 1.7 to 2.25. On each range, zero can be set at left, center, or right of the recorder chart. Numbers on the chart identify the record of each channel automatically. The scanner unit contains the electrical circuits and controls for switching, including two additional check position channels for setting and checking the scanning recorder zeros. In addition to full automatic operation of the system it can be manually advanced through each of the 50 strain gage channels, one at a time.

Heavy Duty Welder

Lincoln Electric Co., Cleveland, O., has announced a heavy duty a-c welder, available in 300, 400 and 500 amp, NEMA rated, sizes for production welding.

The company says the welder, called Fleetwelder Special, has a free circuit reactor control of welding current, separate from the main transformer which can be adjusted continuously through a wide range of currents. The control is also sensitive to a wide range of welding conditions and highly responsive to changing arc conditions. The machines are equally adaptable to sheet steel or heavy plate.

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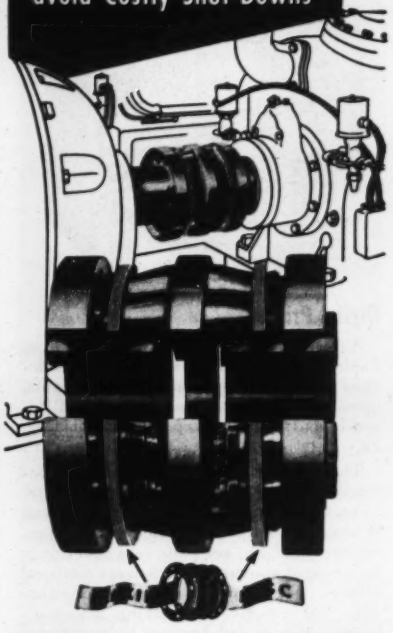
for Power Transmission to avoid Costly Shut-Downs



Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.

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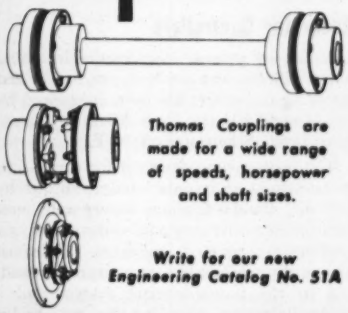
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.



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WARREN, PENNSYLVANIA, U.S.A.

The machine frame, core and case are welded steel and the copper windings have spun glass, refined asbestos and mica insulation and mica coil separators. Current control mechanism operates through a double reduction gear drive with a ball bearing shaft. The unit can be supplied with or without power factor correction. It has a high inbuilt power factor so that fewer capacitors are necessary. Three wheeled undercarriage for portability is optional equipment.

Explosion-Proof Timer

An explosion-proof case has been developed by the Zenith Electric Co. for electric timers to provide protection where timing operations are required in hazardous locations or on dangerous applications. According to the Zenith announcement, these timers can be used to time and control electrically operated equipment such as processing machinery, samplers, laundry and dry cleaning machinery, therapeutic and diagnostic apparatus, beauty parlor and photographic equipment, and blue print machinery.

The setting knob of the timer is directly connected to the switch operating cam. All energy required to operate the switch is built up by the manually setting pointer, releaving motor and clutch of drag. The switch itself is single-pole, double-throw, 1000-w capacity, fully enclosed. The self-starting, slow-speed motor is of the industrial type, synchronous and completely sealed. No energy is required of the clock motor to trip the switch at the end of the preset time, the manufacturer says.

Further information will be supplied by the Zenith Electric Co., Dept. MXN, 152 W. Walton St., Chicago 10, Ill.

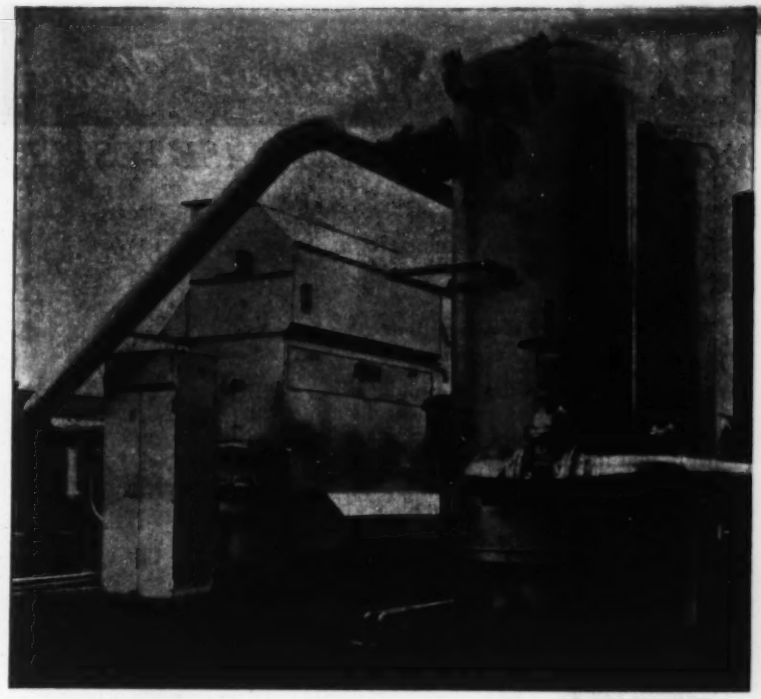
Taconite Duty Motor

With special provisions to resist the deleterious effects of taconite dust, a motor has been designed for taconite mill service by U. S. Electrical Motors Inc. Taconite dust is about 200 mesh, and is highly magnetic, imbeds itself in windings, and clogs the air gap between rotor and stator unless means are provided to guard against its intrusion, the company says.

U. S. Motors has developed a totally enclosed motor for taconite duty claimed to solve the problem. The motor is available with or without internal gearing. Nonmagnetic materials, special seals, and special air filters are used.

While developed primarily for plants milling and handling taconite, this special U. S. motor is also particularly suitable for other locations where the atmosphere is heavily charged with abrasive dusts such as cement mills, foundries, and ore crushing and rock product installations, and in exposed locations where dust and moisture are prevalent.

Descriptive literature on taconite duty motors may be obtained by writing U. S. Electrical Motors Inc., Box 2058, Los Angeles 54, Cal.



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● Direct saving in the cost of cooling water saves the price of the Niagara Aero After Cooler (for compressed air or gas) in less than two years.

Extra, for no cost, the drier air gives you a better operation and lower costs in the use of all air-operated tools and machines, paint spraying, sand blasting or moisture-free air cleaning. Water saving also means less expense for piping, pumping, water treatment and water disposal, or you get the use of water elsewhere in your plant where it may be badly needed.

Niagara Aero After Cooler assures all these benefits because it cools compressed air or gas below the temperature of the surrounding atmosphere; there can be no further condensation in your air lines. It condenses the moisture by passing the air thru a coil on the surface of which water is evaporated, transferring the heat to the atmosphere. It is installed outdoors, protected from freezing in winter by the Niagara Balanced Wet Bulb Control.

Write for complete information; ask for Bulletin No. 98

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Combines speed indicator and stop watch. Replaces "human element" of error in starting and stopping with higher accuracy of calculation because Tachoscope can be operated for longer period. High precision instrument for measuring machine speeds up to 20,000 rpm. Frequently used as a standard for checking other speed measuring instruments. The high quality stop watch may also be used independently.

SPEED MEASURING BULLETIN. A selection chart of Speed Measuring Instruments for specific conditions is a feature of BULLETIN 35-M.

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O-Ring Compound

Compound 1120 is a compound of synthetic rubber material suitable for use in O-rings said to effect sealing of aviation-type fuels under pressure conditions up to 1500 psi over a temperature range of approximately +160 to −65 F. Sealing is effected primarily due to the low-temperature flexibility of the rubber and its tendency to recover from a shrunken condition to one of positive compression in non-aromatic fuel. It will not affect metal as to sticking, staining, and pitting, according to the manufacturer. Volume change is moderate in iso-octane and high in aromatic fuels, +55 per cent to +65 per cent. In flushing fluids, such as MIL-O-6081, volume change is ±5 per cent. The manufacturer states that it is good for aromatic and non-aromatic fuel use, especially when temperatures of −65 to −70 F are encountered. Inquiries on seals and other parts engineered from this compound should be directed to Goshen Rubber Co., Inc., Goshen, Ind.

Automatic Impact Tester

For determination of the breaking point of gear teeth and studying the dynamic properties of parts subject to shock, Tinius Olsen has announced an Automatic Progressive and Repeat Impact Testing Machine. In operation, a hammer of known weight is automatically raised and dropped on the test specimen from progressively higher points until the specimen breaks. The quality of the material under test can be determined from the height of the fall at fracture and number of blows delivered.

After each stroke, the hammer is picked up on the rebound by a motor-driven chain and raised to the next dropping point. Height of fall is increased by one-inch increments for each succeeding stroke. The machine can also be set to deliver the impact repeatedly from any desired height between 6 in. and 10 ft. The specimen holder can be adjusted to accommodate test materials up to 24 in. in height. T-slots are provided in the bed plate to facilitate positioning specimens of various shapes. Further information is available upon request to Tinius Olsen Testing Machine Co., 1164 Easton Rd., Willow Grove, Pa.

Cylinder and Positioner Unit

An assembly consisting of a Stabiload power cylinder and the new Foxboro Cylinder Positioner has been developed by The Foxboro Co., Foxboro, Mass.

Claiming both cylinder efficiency and positioning accuracy, the unit will operate dampers, coal gates, valves, variable-speed drives, and other combustion control devices requiring up to 6-in. stroke, with no multiplying linkages needed.

Operating from a 3-15 psi pneumatic controller output, the positioner is a force-balance type of device that applies an air

pressure differential across the cylinder piston. A change in the piloting signal produces a corresponding position change of the cylinder piston, after which the positioner automatically returns to its null balanced condition. Foxboro says the assembly responds to a change in signal pressure of 1/4 of 1 per cent of range and positions a piston within 1 per cent of its total stroke under normal loading conditions.

The Foxboro Stabiload cylinder used has a 4 1/2-in. bore and 6-in. maximum stroke, developing pull force of 2121 psi and push force of 2385 psi when maximum air pressure (150 psi) is applied. Cylinders of other sizes and ratings are also available. Technical report, TI 31-H-123b, describing the assembly, will be sent on request.

Central Filter Control

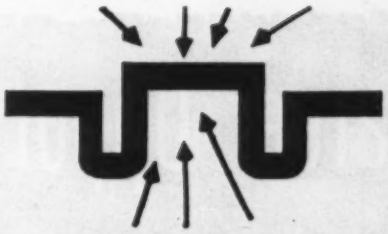
Builders-Providence, Inc., 345 Harris Ave., Providence, R. I., announces "Auto Central Filter Control," a system of a semi-automatic sequence operation for backwashing rapid sand water filters, developed to relieve plant personnel for other duties and insure accurate backwashing rates and duration to maintain maximum filter efficiency.

The system signals the need for filter backwashing in accordance with loss-of-head conditions, the company says. The backwash cycle is then initiated and carried out, and the filters returned to operation automatically, without further attention from the operator. Operation can be changed to manual, if desired.

Auto Central Control consists of control panels, containing loss of-head gage, filter rate setter, valve position indicators, sequence controller, backwash gage, backwash starter button and accessories. Control panels are placed in a central location. Auto Central Control was developed for and has been successfully used with the Dorrco Aldrich Perifilter, but the company says it is also applicable to all other types of rapid filter installations.

VOLUNTEERS NEEDED

NEW



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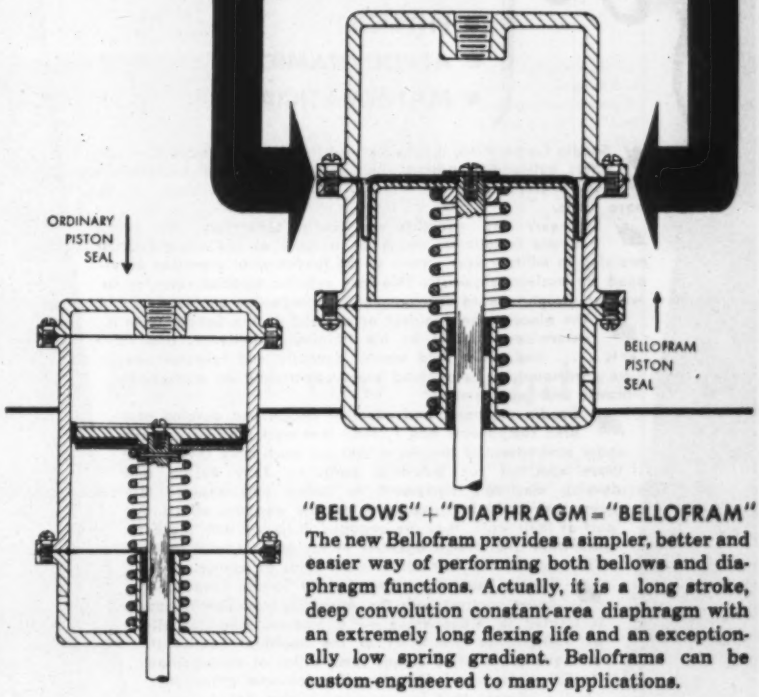

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The new Bellofram provides a simpler, better and easier way of performing both bellows and diaphragm functions. Actually, it is a long stroke, deep convolution constant-area diaphragm with an extremely long flexing life and an exceptionally low spring gradient. Belloframs can be custom-engineered to many applications.

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Belloframs give exceptional cycle life. Infrequent and simple replacement is the only maintenance. They can be made to operate at pressures ranging from 1/4" H_2O min. to 500 PSIG maximum over a wide range of temperatures. Effective area can be controlled to within less than 0.1% over the working stroke. Ask about a Bellofram designed to meet *your* specific needs. Send us a sketch of your device and we will show you how simply Bellofram may be applied. Strictest confidence observed. Write today.

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Sandia engineers and scientists design and develop complex components and systems that must function properly under environmental conditions that are much more severe than those specified for industrial purposes. They design and develop electronic equipment to collect and analyze test data; they build instruments to measure weapons effects. As part of their work, they are engaged in liaison with the best production and design agencies in the country, and consult with many of the best minds in all fields of science.

Sandia Laboratory, operated by Sandia Corporation under contract with the Atomic Energy Commission, is located in Albuquerque — a modern, mile-high city of 150,000 in the heart of the healthful Southwest. Albuquerque offers a unique combination of metropolitan facilities plus scenic, historic and recreational attractions; and a climate that is sunny, mild, and dry the year around. New residents have little difficulty in obtaining adequate housing.

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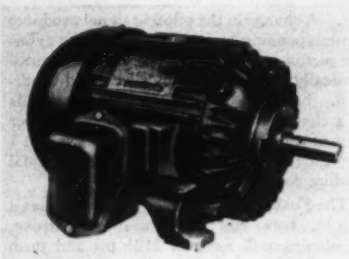

Electric Motors

The Allis-Chalmers Mfg. Co. has announced a new line of alternating-current squirrel-cage induction motors in frame sizes 326 and smaller. The new design of frame sizes up to and including 326 follows the newly established NEMA standards.

Allis-Chalmers has also developed new open and totally enclosed (fan-cooled and explosionproof) models.

Allis-Chalmers engineers point out that the efficiency and power factors of the new motors may change slightly from the values obtained in present designs, but that the product of efficiency and power factor will remain relatively the same. The new models will have cast-iron frames and end shields. Rotors will be pressure-cast of aluminum. Bearings will be grease-lubricated, medium-series, double-shielded ball bearings. Stator windings will be the random or mush-wound type of Formvar-coated wire in semi-closed slots.

In the new open motor, Type G, the intake openings in the end shields will have greater protection than in the old design, according to the company. All continuous rated totally enclosed motors under Allis-Chalmers new design (Type GZ and Type GZZ), will be fan-cooled. According to company officials, Allis-Chalmers' new motors will be initially available in frame sizes 182 and 184. Larger frame sizes will become available at approximately five-month intervals. Production is already underway on the 182 and 184 frames.

Blind Fastener

New, blind expansion fasteners, trademarked Neo-Grip by Star Expansion Products Co., 147 Cedar St., New York 6, N. Y., have been designed to secure objects to building and construction materials without tearing or shattering them. The "cushioned expansion action" of the neoprene base rubber sleeve of the fastener is said to exert pressure without tearing soft products or shattering frangibles such as glass, tile, or ceramics. They are being used with such diverse products as fiber material, gypsum products, plaster, plaster board, asbestos cement products, cork, plastics, glass, ceramics, masonry, and metal, according to the manufacturer.

Neo-Grips are installed by drilling the hole, inserting the fastener, and twisting the special tool to tighten it. The P110 fastener has an overall length of $^{7}/_{16}$ in. and an OD of $^{1}/_{2}$ in. The P125 fastener has an overall length of $^{1}/_{2}$ in. and an OD of $^{9}/_{16}$ in. Minimum material thickness required is $^{3}/_{4}$ in. for the P110 fastener and $^{1}/_{2}$ in. for the 125. Neo-Grips are packed 100 to the box with special tool included.

Butyl-Molded Transformer

A new butyl-molded miniature current transformer, featuring both window-type and bar-primary construction, has been announced by the General Electric Co.'s Meter & Instrument Dept., Schenectady 5, N. Y.

It has been designated the JCA-O current transformer and is designed for operating meters and instruments and can be used on either single-phase two-wire or polyphase circuits. It is rated at 600 v and is suitable for use on any circuit of 600 v or below. The window-type unit is said to be ideal for operation over a bar-primary conductor on circuits up to its rated voltage.

Current ratings of 200:5 and 400:5 amp are available in both the window and bar-primary models. These ratings are obtained in the window-type unit by passing the line conductor once through its window. The ASA accuracy of the new JCA-O current transformer is as follows: 200,400 Amp, 60 cycles, burden B-0.1 and B-0.2 accuracy class 0.3. The device is built to carry its rated current continuously with a 55 C ambient temperature without overheating With a 30 C ambient temperature it will carry 200 per cent rated current without exceeding the allowable 55 C rise, the engineers point out.

The product's molded butyl serves as insulation and support and casing. It can be mounted in almost any position, indoor or outdoor, and is especially suitable for use in small boxes.

The window-type transformer weighs from $2^{1}/_{4}$ to $2^{1}/_{2}$ lb; bar-primary type from $3^{1}/_{2}$ to 5 lb. Both models can be equipped with an auxiliary mounting plate.

Temperature Control Valve

A new temperature control valve has been announced by Klipfel Valves, Inc., Hamilton, Ohio. The valve, designated as No. 1549, is pilot operated and is a tight closing type valve, the company says. Particularly in the larger sizes, the valve is designed for high pressure service. The 5-in. and 6-in. sizes are double seated, while smaller valves are single seated.

The pilot valve is actuated by hydraulic expansion of the thermo-sensitive charge in a one piece metal bellows. It employs the inlet pressure to control the main valve, admitting the inlet pressure to the diaphragm chamber, opening the main valve when temperature is low and allowing it to bleed off when temperature is high.

The valve has a 50-deg F range of adjustment and is manufactured in sizes from $^{3}/_{4}$

Downingtown-built atmospheric stripper and accumulator column, 6' 6" i.d. by 3' 10" i.d. by 76' 10" l. This complex design required extensive use of solid Monel and Monel clad materials.

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Order plate fabrication from Downingtown Iron Works. That's the easy way to turn your complex designs into smooth-working process equipment—the sure way to be sure of skillful workmanship in every detail.

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We're set up to fabricate pressure vessels of all kinds, in full compliance with ASME and other code requirements. Our experienced Engineering Department will be glad to work with you on your next project. Write for helpful literature.

DOWNINGTOWN IRON WORKS INC. Hackney

DOWNINGTOWN IRON WORKS, INC.

HEAT EXCHANGERS—TOWERS—PRESSURE VESSELS
STORAGE TANKS—STEEL AND ALLOY PLATE FABRICATION

Downingtown, Pennsylvania

New York office: 52 Vanderbilt Avenue, New York 17, N. Y.

DIVISION OF

Pressed Steel Tank Company

MANUFACTURER OF HACKNEY PRODUCTS

Milwaukee 14, Wisconsin

CONTAINERS AND PRESSURE VESSELS FOR GASES, LIQUIDS AND SOLIDS

Combined experience of Two Hundred and Fifty Years In the manufacture of Boilers

JOHN THOMPSON LIMITED
Wolverhampton, England
Established 1824

and

E. LEONARD & SONS LIMITED
London, Canada
Established 1834

have amalgamated to form a new Company to be known as

JOHN THOMPSON-LEONARD LIMITED

This brings together Leonards, a firm long held in high esteem throughout Canada, and Thompsons, one of the largest manufacturers in Europe of shell boilers, and one of the World's leading designers and manufacturers of water tube steam generators and auxiliary equipment.

In U.S.A.

441 Lexington Ave.
New York 17, N. Y.

Can a
CHIMNEY ENGINEER
save you money ?

Indeed he can!

He can tell you if it is the correct size for most efficient fuel consumption and operation—and if additions are required or repairs needed, he can make specific recommendations and submit designs and specifications.

We are chimney engineers, specializing in this one field, and build, treat or repair chimneys of all types to keep boiler efficiency high and fuel costs low. You can save money on operating expenses by having a Consolidated engineer inspect your chimney at no inconvenience to you.

Design—Construction
Linings—Water Proofing
Repairs
Aircraft Warnings
Lightning Rods
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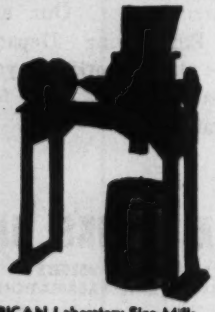
Write today for Literature on Building and Repair Service.

Two 292 ft. x 11 ft. Concrete Chimneys with Acid Proof Brick Linings designed and built for Northern States Power Co., Minneapolis, Minnesota.

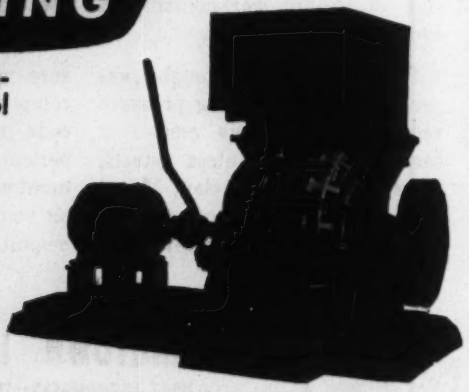
CONSOLIDATED CHIMNEY CO.
Engineers and Builders
6 South Dearborn St., Chicago 3, Ill.

from TEST GRINDING to TONNAGE CRUSHING

AMERICANS are custom-built to do a better job!



AMERICAN Laboratory Size Mills
With the same reduction action as Metal Turnings Crushers (or hammer action)—American Laboratory Size Mills offer an efficient means for reducing razor blades, pewter castings and fragile thin brittle steel to a reclaim product.



AMERICAN Metals Turnings Crushers
Bulky, hard-to-handle turnings are rapidly reduced as much as 80% with this efficient, economical crusher. And the yield of cutting oil is increased 20 to 50 gallons per ton—proof of how profitable the installation of an American Metal Turnings Crusher can be for those who handle 20 tons or more of metal turnings a month.

There's a custom-built AMERICAN for your operation—write for further data and specifications.

American PULVERIZER COMPANY
Originators and Manufacturers of Ring Crushers and Pulverizers
1541 MACKLIND AVE.
ST. LOUIS 10, MO.

KEEP INFORMED

in. to 6 in. Sizes 2 in. and larger have semi-steel bodies. Smaller sizes have bronze bodies. Stainless steel valve trim is used on sizes 4 in. and smaller. Larger sizes have bronze trim as standard but can be supplied with stainless trim. Eight feet of capillary tubing and nickel plated bulb is standard on all sizes.

Insulation Finish

A new insulation finish called Monoplast that may be trowelled on in one coat to provide a clean, light-reflecting white finish through the entire range of refrigerated room temperatures down to −80 F has been developed by the Armstrong Cork Co. low-temperature insulation department, Lancaster, Pa. The company says Monoplast provides a finish for cold room interiors that improves their appearance, brightens them, and is easy to maintain. The new material is applied in a single coat to corkboard and no scoring, painting or additional finishing is required. It weighs only about one-fifth as much as a two-coat portland cement plaster finish, and may be trowelled to ceilings, as well as walls, without use of metal lathe, hexagonal mesh wire, netting, or any other support.

Where drying conditions are good, refrigeration can be turned on after Monoplast has been allowed to set overnight, the company says. The new material reflects 72 per cent of the light that strikes its surface.

BUSINESS NOTES

B & W Open District Office

A new district sales office for the Tubular Products Division of The Babcock & Wilcox Co. has been opened at 2330 Victory Parkway, Cincinnati, O. The territory served will include Southern Ohio, Southern Indiana, Kentucky, Alabama, Georgia, South Carolina, and North Carolina.

Junger Steel Appointed

Allegheny Ludlum Steel Corp., has announced the appointment of Junger Steel and Supply Co., with offices at 765 Hampden Ave., St. Paul, Minn., to sell the complete line of Ludlum tool steel, bars, forgings and castings. The warehouse is located at 1179 Fifteenth Ave. S. E., Minneapolis, Minn.

Pa. Crusher Moves Offices

The Pennsylvania Crusher Co. has moved its offices from Philadelphia to its own building in West Chester, Pa. The test crush laboratory with its full line of crushers and screen analysis equipment is also being moved from Norristown, Pa. to the new quarters, thus putting the engineering department and the laboratory, as well as the general office staff, all in the same building.

New Peerless Distributor

Peerless Photo Products, Inc., Shoreham, L. I., N. Y., has appointed Royel Blue Print Co., 62 Fremont St., San Francisco, as its distributor for northern California.

Hamer Oil Tool Changes Name

A change of the company name from Hamer Oil Tool Co., to Hamer Valves, Inc., has been announced by the organization.

The company said change was made primarily to identify more clearly the company with the products it manufactures. It is located at 2919 Gardenia Ave., Long Beach 6, Calif.

Opens Buffalo Office

Superior Steel Corp., Carnegie, Pa., announces the opening of a new district sales office at 1212 Rand Bldg., Buffalo, N. Y. Thomas C. Collins was named district manager of the Buffalo office, which will cover the upper western New York state and Toronto-Hamilton areas.

Goshen Rubber Opens New Silicone Plant

Building construction has been completed and pilot operations are under way in a new plant by Goshen Rubber Co., Inc., Goshen, Ind., for fabricating precision-molded silicone parts. Located adjacent to the main plant, the new structure when in full operation will house the latest facilities and departments, including presses, mills, extruders, curing ovens and trimming equipment.

De Laval Sets up New Sales Office in St. Louis

A new sales office and the appointment of William F. Young as sales engineer in charge has been announced by the De Laval Steam Turbine Co., Trenton 2, N. J. The new office is located at 25 S. Bemiston Ave., St. Louis, Mo., and it will operate as a branch sales office of the De Laval's Chicago district office.

Air Gage Catalog

A new catalog, No. 613, on Taft-Peirce Compairator air gages is available on request to the company at Woonsocket, R. I. The 28-page catalog covers the various types of compairator units and illustrates many inspection problems solved by air gaging. Also included are specifications and size ranges of the company's standard air ring and air snap gage members.

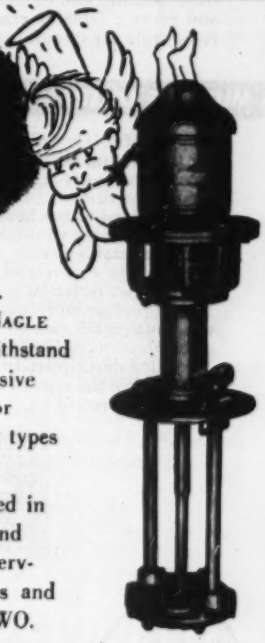
To everyone this is
a sign of peace

And to smart gear users
this CINTI is a sign
of *good* gears.

CINTI "Gears... Good Gears Only"

THE CINCINNATI GEAR CO. • CINCINNATI 27, OHIO

THIS PUMP HAS A Conscience!

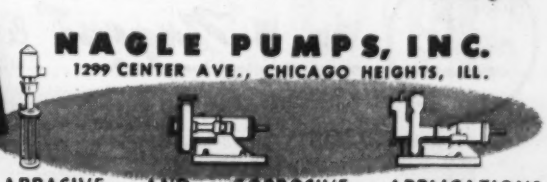


It will guard your investment with its life. Outlasting ordinary pumps many times, NAGLE PUMPS are designed and constructed to withstand abusive service, such as pumping highly abrasive mixtures, corrosive liquids, hot solutions or heavy slurries. Horizontal and vertical shaft types in complete range of sizes.

Type "SW-O" shown, is directly submerged in material to be pumped. Free of packing and bearing troubles. Rendering outstanding service in important processing plants, mines and mills. Get the facts—ask for Bulletin SWO.

NAGLE PUMPS

NAGLE PUMPS, INC.
1299 CENTER AVE., CHICAGO HEIGHTS, ILL.

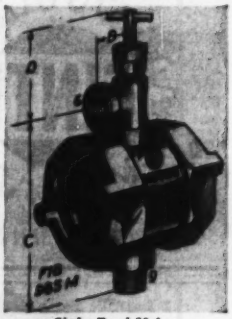


PUMPS FOR ABRASIVE AND CORROSIVE APPLICATIONS

DESIGN AUTOMATIC POSITIVE LUBRICATION INTO YOUR PRODUCTS with NUGENT LUBRICATING SPECIALTIES

SIGHT FEED VALVES

Sight Feed Valves provide a means of regulating and visually checking oil flow at the point of delivery to bearings, gears, etc. By regulating the Sight Feed Valve, oil flow is controllable from 2 drops per minute up to 21 U.S. gallons per hour. The oil stream through the valve is visible at all times through a removable, dust-proof sight glass. Sizes ¼" to ¾" i.p.s. for working pressures to 125 p.s.i.



Sight Feed Valve

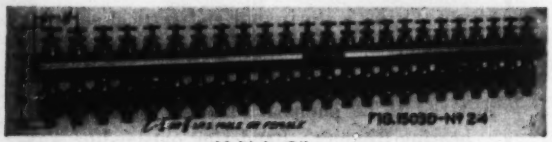
SIGHT FLOW INDICATORS

With a Nugent Sight Flow Indicator installed in your lubrication system, you can tell at a glance whether or not oil is flowing properly to vital parts. The Sight Flow Indicator can also be wired with an alarm bell to sound in any desired location—enables you to correct troubles quickly and protect valuable equipment. Windows are removable for cleaning. Sizes from ½" to 6".

MULTIPLE OILERS

Nugent Multiple Oilers are designed for lubricating enclosed bearings and other hard-to-get-at spots. Oil from a pump or reservoir is piped to the oiler and fed to the bearings by means of tubing through independently adjustable needle valves. Available in a variety of types with any number of feeds.
In addition to lubrication specialties, Nugent offers a complete line of lubrication devices and oil filters. Write for descriptive literature, mentioning the type of equipment you are interested in.

Sight Flow Indicator



Multiple Oiler

Wm. W. Nugent & Co., Inc.
409 N. Hermitage Ave. • CHICAGO 22, ILLINOIS

KEEP INFORMED — NEW EQUIPMENT · BUSINESS NOTES · LATEST CATALOGS

Equipment Protection

A new six-page folder just issued by Hall Laboratories, Inc., Hagan Bldg., Pittsburgh 30, Pa., cites examples, and suggests various methods used for protecting water using equipment during shutdowns.

Electroplating Rectifiers

An illustrated eight-page bulletin describes different types of Wagner Brothers electroplating rectifiers, with capacities from 5 to 50,000 amps, standard and special designs, and regulators and controls for use in the plating industry. The bulletin, B 20-54, is available from Wagner Brothers, Inc., 400 Midland Ave., Detroit 3, Mich.

Gage Illuminators

New Data Unit 242 describing Jerguson gage illuminators, said to give even diffusion of light over entire gage length, is available from Jerguson Gage & Valve Co., 80 Fellsway, Somerville, Mass.

Plug Valves

A new 24-page reference book No. 39-5 shows Homestead Lubricated Plug Valves in full-port and venturi types, sizes up to 14 in., with a choice of self-sealed two-piece plug or one-piece plug designs. Engineering information includes principal dimensions, types of control, metals, lubricants. It is available from Homestead Valve Mfg. Co., Coraopolis, Pa.

Die Castings

A new four-color, 24-page brochure issued by the Precision Castings Co., Inc., P. O. Box 1077, Syracuse 1, N. Y., describes the company's integrated facilities and operational functions, and contains more than 75 pictures, drawings and charts to explain die-casting processes, including die-building, alloying, casting, trimming, machining, plating, finishing and inspection.

Micrometer Pamphlet

The George Scherr Co., 200 Lafayette St., New York 12, N. Y., announces a new four-page pamphlet on Scherr micrometers. The instruments are furnished in two styles: series 900 with "Lustro-Chrome" dull finish throughout; and series 800 with black enamelled drop-forge steel frame, including a "Lustro-Chrome" dull chrome finished thimble and barrel. All micrometers up to the 3 in. size read in 1/10,000 in. The pamphlet includes illustrations of micrometers being adjusted for wear by an exclusive method: being checked for accuracy with gage blocks and for parallelism with optical parallels; a toolstand used for clamping a micrometer; micrometer sets in various combinations; and depth micrometers. A price list contains prices on all items in the pamphlet and a listing of Scherr Ultra-Chex Gage Blocks in three types of sets.

AIRCRAFT ENGINEERS

With Experience

WANTED AT

GRUMMAN

LAYOUT DESIGNERS
Airframe Structures
Equipment Installations

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Systems Design
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STRUCTURES
Stress Analysis
Static Testing

RESEARCH
Computer Engrs-Digital or Analog
Vibration & Flutter Engineers
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ARMAMENT INSTALLATION
AERODYNAMICS
INSTRUMENTATION

TOOL ENGINEERS

Recent Graduates with Aeronautical, Mechanical, Civil or Engineering Physics Degrees may qualify

Proof of U. S. Citizenship required

APPLY IN PERSON
OR SEND RÉSUMÉ TO:
Engineering Personnel Dept.
INTERVIEWS AT
Employment Office
South Oyster Bay Road,
North of Railroad
Monday thru Friday
8:30–11:30 AM; 1:30–3:30 PM

GRUMMAN AIRCRAFT
Engineering Corp.
Bethpage, N. Y.

Torque Limiters

A new eight-page, illustrated two-color catalog, C14-54, describing Morse Torque Limiters, is now available from Morse Chain Co., 7601 Central Ave., Detroit 10, Mich.

Complete design and operation information is given in the catalog as well as specification tables for a line of 11 standard models having torque capacities ranging from 20 to 620 ft-lb.

Split Metal Raschig Rings

"J-M Raschig Rings" is the title of a four-page folder issued by Johns-Manville. These split metal Raschig Rings are made from any required metal in diameters from 1/4 in. to 3 in. They are available in almost any size or thickness of metal, in many different ratios of diameter to length, for packed towers in absorption, fractionation, extraction, and other related processes.

The folder provides data for engineering firms who are designing and constructing new towers and for engineers who specify packing for existing towers. Copies of "J-M Raschig Rings" are available from Johns-Manville, 22 East 40th St., New York 16, N.Y.

Electrical Modernization in Industrial Plants

A 16-page booklet on electrical modernization in industrial plants is available from Westinghouse Electric Corp. Titled "Compete or Collapse," the booklet says that the first step in any modernization program must be the efficient distribution of electrical power.

Sections of the booklet explain that a modern electrical system can increase output, lower operating cost, reduce down-time and maintenance, and increase safety and reduce safety protective rates. The principal elements of a modern electrical system are described and illustrated, and their advantages outlined.

Booklet B-6133 is obtainable from the Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa.

Additional Opportunities are offered in the display advertisements— on pages

44, 54, 59, 69, 89, 90

PPC

When You Buy

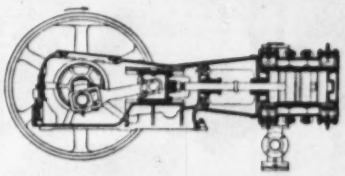
Pumps and Compressors

DO YOU WANT | LONG LIFE, EASY MAINTENANCE, RELIABILITY

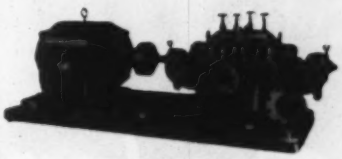
These Are **BUILT-IN** *By* **PENNSYLVANIA**

AIRCHEK VALVE
Automatically prevents reverse flow through Compressor and also dampens pipe line pulsations.

This Check Valve should be on EVERY Compressor. Bulletin 509 E



OILFREAIR & OILFREGAS Compressors Class ATL with steel-backed carbon cylinder-liners. Guaranteed to compress free of any trace of oil or oily vapors.
Bulletin 600 E



PENNSYLVANIA 4-Stage THRUSTFRE Centrifugal Pump for Boiler Feeding, General Power Plant and Industrial Use.
Bulletin 237 E

YOUR Copy of Catalog 546 briefly describes All PENNSYLVANIA Products. Write For It Today.

PENNSYLVANIA
Pump & Compressor Co.
EASTON, PA.

OILFREAIR ®
OILFREGAS ®
THRUSTFRE ®
AIRCHEK ®

PANGBORN **STOPS** THE DUST HOG!

Pangborn **DUST CONTROL**

"a profitable investment"

says Detroit Edison—reduces fire hazards, cuts dust damage to machinery, and salvages profitable quantities of dust from 4,500,000 tons of coal handled annually.

What can Pangborn do for you?

50th Anniversary Medallion

Pangborn engineers will be glad to discuss *your* dust control needs, show you how Pangborn equipment can save you time, trouble, and money. For more information, send for Bulletin 909-A today! Write to: PANGBORN CORPORATION, 2200 Pangborn Blvd., Hagerstown, Maryland.

KEEP INFORMED — NEW EQUIPMENT · BUSINESS NOTES · LATEST CATALOGS

Pumps, Compressors, Rock Drills

Gardner-Denver Co., Quincy, Ill., has introduced a compact catalog covering the complete line of Gardner-Denver pumps, compressors, rock drills and pneumatic equipment widely used throughout construction, mining, petroleum and general industry.

The new catalog is designated as GP-100 and is available on request.

Ceramic Coatings

A new brochure describing ceramic coatings for protecting metals has been published by Solar Aircraft Co., Dept. 701, San Diego 12, Calif. The booklet covers the uses and properties of Solaramic coatings. It includes an extensive check list of the properties of Solaramic coatings under high temperature, medium temperature, and corrosive service and a listing of the basic metals to which coatings can be applied for various service conditions, a check-list of considerations in designing metal parts that are to be ceramic coated. The booklet also contains a series of case histories, and graphs showing typical oxidation rates based on temperature and length of service.

Ring Gage Brochure

Size Control Co., 2500 W. Washington Blvd., Chicago 12, Ill., has released a brochure describing "Boremaster," new low cost ring gages designed especially for setting dial bores and other types of inside measuring devices. The brochure also shows many reversible plain and thread plug gages and the company's new 25 per cent discount on AGD plain ring gages.

Permanent Magnetic Units

A new 36-page illustrated booklet on permanent non-electric magnetic equipment designed for steel handling and conveying has been published by Eriez Mfg. Co., Dept. SH, Erie, Pa.

The booklet outlines briefly how the company says steel handling equipment utilizing permanent non-electric magnetic units can increase production and reduce downtime, reduce the labor force, increase efficiency, reduce operating costs, result in safer operations. Comparison is made between this and other methods of steel handling and conveying. The booklet covers the possible application of Eriez holding and conveying equipment in skelp mills, in continuous and non-continuous butt weld pipe mills, and in sheet and tin mills. Classifier magnets, galvanizing dragout rolls and hold down magnets are informatively described in terms of use and construction.

Units illustrated include: skelp drum and skelp roll, medium and heavy duty pipe control roll, pipe conveyor roll, various types of hold down magnets, magnetic tail pulley for Kaufmann classifier; also suggested layouts for galvinizing dragout rolls, 3-piler tin plate classifier, and others.

KEEP INFORMED

NEW EQUIPMENT
BUSINESS NOTES
LATEST CATALOGS

Welding Design Manual

A new, 14-page illustrated manual is announced by the Eutectic Welding Alloys Corp. It is entitled "Manual of Design and Welding Engineering," and contains detailed instructions on joint design with many drawings showing the difference between good and bad design. It shows the types of joints possible, their names and when and why they should be used on a given operation. A section is devoted to overlaying and hard-surfacing. Illustrations show inspection and control how to judge the efficiency of a welded joint and why a badly designed joint could be expected to fail under service conditions. Copies are available free from the Eutectic Welding Alloys Corp., 40-40 172 St., Flushing 58, N. Y.

Oil Burners

A bulletin on oil burners, issued by The Engineer Co., describes a number of types and sizes of both interchangeable and non-interchangeable burners. The former permit substitution of steam, air, and mechanical atomizing guns for each other on the same gun support with an in-built scavenging valve.

A section is devoted to an outline of the basic requirements for the efficient burning of liquid fuels, and the relative merits of steam and mechanical atomization. Another section describes the type of air registers used for natural and forced draft, and for oil burning alone or in combination with gas firing.

Copies will be sent upon request to The Engineer Co., 75 West St., New York 6, N.Y., for Bulletin O. B. 53.

FOR A BRIGHTER TOMORROW GIVE TODAY

UNITED CEREBRAL PALSY

YOUR HELP IS THEIR HOPE!

GIVE TO YOUR LOCAL AFFILIATE

ready-made hangers and eliminators

give you custom-made results

When you use our functional spring hangers . . . which have the Blaw-Knox patented *internal swivel action* . . . and our vibration eliminators, you get custom-made results. And that holds good for rigid hanger assemblies and overhead roller assemblies.

Each is a complete unit, designed to serve a particular purpose, so that proper selection cuts your engineering time and expense . . . yet enables you to meet the most exacting standards. And each is ready to install so that you eliminate expensive cutting, threading and assembling in the field.

Our engineers, who have solved many tough hanger and piping vibration problems, are always available to both design and make recommendations for your hanger requirements.

Write for your copy of Bulletin No. 54 to get more information on our complete line of hangers, supports and eliminators.

BLAW-KNOX COMPANY
Power Piping and Sprinkler Division
Pittsburgh 33, Pa.

BLAW-KNOX PIPE HANGERS

Complete line of functional spring hangers • rigid hanger assemblies • overhead roller assemblies • supports • vibration eliminators . . . plus complete prefabricated power piping systems for all pressures and temperatures

mechanical engineers . . .

THERE'S KNOWLEDGE at your FINGERTIPS in PHILADELPHIA attend the POWER SHOW

Learn the latest techniques in use for the maximum development and utilization of mechanical, steam, electrical, hydraulic and pneumatic power.

See the panorama of new power products exhibited by nearly 300 leading equipment manufacturers.

Save time, money and effort by taking advantage of this concentration of engineering information. Consolidate months of research into days of observation.

Take home specific details on products and processes learned directly from the skilled and experienced technicians manning every exhibit.

Turn time into money—a few short hours in exchange for cost-saving ideas which can be translated into up-to-the-minute improvements in your plant operation.

PLAN NOW TO ATTEND

Write early for hotel reservations and advance registration

Under the auspices of the ASME

Management: International Exposition Co.

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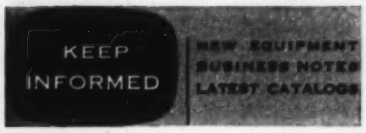


Oil Recovery Units

Kleer-Stream automatic oil recovery units designed for use with parts washers, coolant sumps and reservoirs handling liquids containing oil are described in Bulletin KS-54 available from Detroit Harvester Co., Pioneer Pump Div., 14300 Tireman Ave., Detroit 28, Mich. Operation of the unit that recovers oil from a wide range of industrial liquids permitting its reuse and reducing the problem of stream pollution is covered in simple, non-technical language.

Honing Applications

A new 12-page booklet listing 35 benefits that can be realized from honing is now being distributed by Sunnen Products Co., 7910 Manchester, St. Louis 17 Mo. The working principle of Sunnen honing and how it differs from other metalworking methods is described and pictures and production data on numerous typical honing applications are given.

Homo Method for Tempering

A new 20-page catalog, "The L & N Homo Method for Tempering," tells operating results being obtained in plants by users of Homo furnaces. Photos and descriptions of typical installations, cut-away views of the furnaces, description of the control instruments, and complete specifications about furnace sizes, work baskets and trays are given. A copy of Catalog TD2-625, will be sent upon request from Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa.

Electronic Gaging Equipment

Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, O., has announced a technical bulletin, No. 541, on the measuring system used in Cleveland electronic dimensional gaging equipment. It includes a block diagram showing the principal parts of the gage head and low-frequency amplifier which comprise the measuring circuit, and explains how the gage head produces a signal to show the position of the gage head stem, either side of zero, by a meter or recorder. A schematic diagram of the amplifier circuit is included, with a list of circuit components.

Tractor Attachments

"9 Profitable Minutes for Contractors" is an illustrated booklet published by Hyster Co. to explain to contractors how they can increase productivity of new or used tractors by adding the right attachment.

Many cost and time saving ideas, taken from case studies, are said to be included in the booklet. Photographs show tractors and attachments working in a variety of construction operations.

The brochure, Form No. 1305, is available free from Hyster Co., 2902 N. E. Clackamas St., Portland 8, Ore.

KEEP INFORMED

NEW EQUIPMENT
BUSINESS NOTES
LATEST CATALOGS

Vibrating Conveyors

A new booklet, No. 135-A, describing its line of vibrating conveyors is available from Hewitt-Robins, Inc., Stamford, Conn. The booklet illustrates typical installations handling such material as red hot steel castings, scrap metal, sand, shredded wood bark, and crushed limestone, and covers technical details of both Rockermount and Springmount type conveyors.

Core Plates and Slip Jackets

"Transite-Pallite" is the title of a four-page illustrated folder issued by Johns-Manville containing information on Transite Core Plates and Slip Jackets. It also presents J-M's newest asbestos product for the foundry trade: Pallite Plates and Form Driers developed especially for dielectric and electronic furnaces.

The folder covers recommendations for use, performance characteristics, and illustrations of the materials in service. Copies of this new Transite-Pallite folder are available from Johns-Manville, 22 East 40th St., New York 16, N. Y.

Industrial Equipment

A bulletin on industrial equipment is being offered by Worthington Corp. The bulletin contains information about special features, types, sizes, and capacities of Worthington's various product lines of industrial equipment, and describes the application of each of these lines in various industries.

A number of illustrations show, as representative samples, how Worthington products apply in different types of industry. For copies of this bulletin, requests for Bulletin WP-1099-B61 should be directed to Advertising and Sales Promotion Dept., Worthington Corp., Harrison, N. J.

Vises and Clamps

A new General Catalog has been announced by the Wilton Tool Mfg. Co. of Chicago. Called General Catalog No. 110, this issue describes the vises, clamps, and positioning devices produced by Wilton.

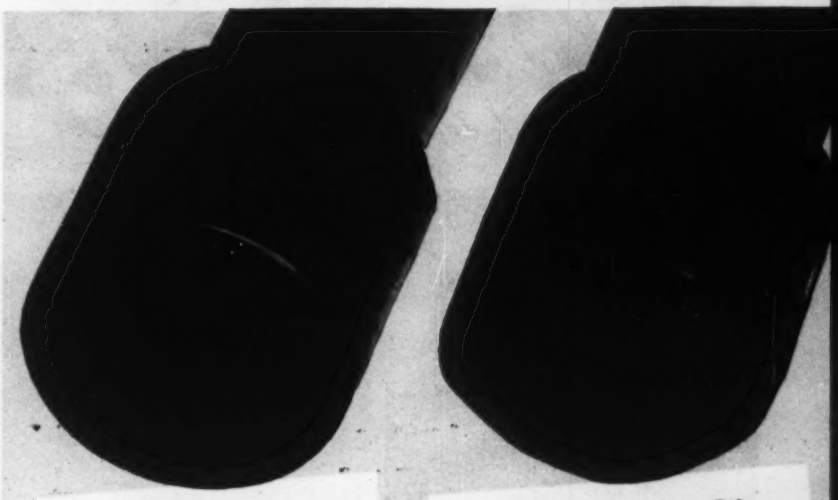
Free copies without obligation will be supplied by the Wilton Tool Mfg. Co., Dept. CR, 941 Wrightwood Ave., Chicago 14, Ill.

Servo Motors

A four-page catalog on A-C Servo Motors and Tachometer Generators has been announced by G-M Laboratories, Inc. Sizes of servo motors listed range from 0.980-in. to 1.70 in. diam and are for use on 60 and 400 cycles at voltages from 26 to 115.

Applications range from gun sights and guided missiles through altimeters, direction finders, and servo circuits in general. Requests for Servo Motor Catalog No. 4 should be addressed to G-M Laboratories, Inc., 4300 N. Knox Ave., Chicago 41, Ill.

COMPARE these Scarfing Rings used in the tip of a Gas Torch . . .



KENTANIUM Ring after 1,960 HOURS

SUPER-ALLOY Ring after 162 HOURS

There's no sign of wear on the Kentanium ring and it's still on the job . . . after 1,960 hours (80 days) of service! Compare this performance with that of the super-alloy ring that had broken down from thermal shock, abrasion, and oxidation after only 162 hours . . . a better than TEN to ONE record in favor of Kentanium. This is a typical example of how industry is effectively using heat-resistant Kentanium.

What's Your HOT Design Problem?

If you need a material having long service life at elevated temperatures, investigate Kentanium . . . an exclusive development by Kennametal. It is a titanium carbide base composition.

Kentanium resists thermal and physical shock, withstands abrasion and oxidation, and retains great strength at 1800°F and above. It weighs only ⅓ as much as steel; is up to 93 RA in hardness.

Many grades of Kentanium are available to meet combinations of specific conditions. A wide variety of simple or complex shapes can be produced, to meet your specifications. Ask our engineers to recommend how you can best apply this remarkable, new heat-resistant material.

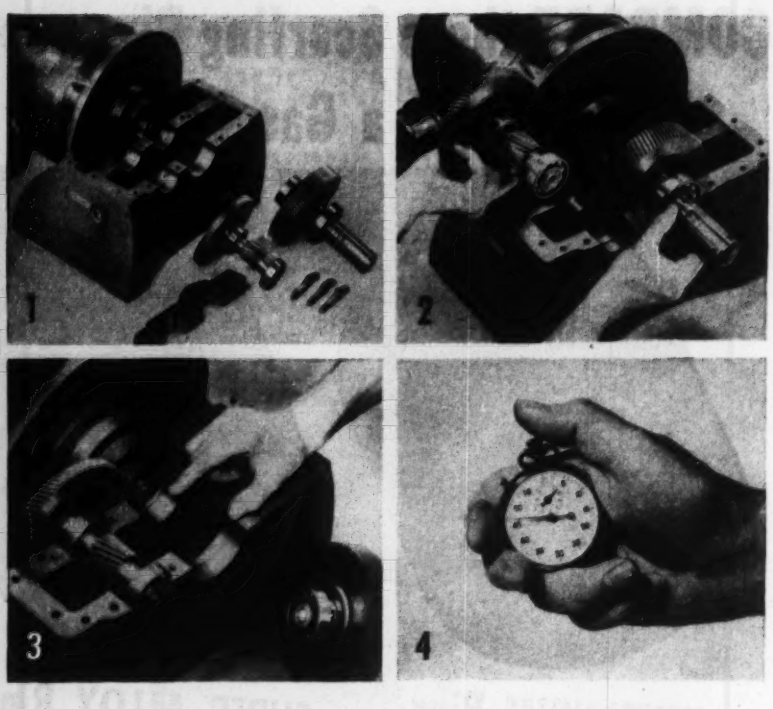
An Exclusive Development of KENNAMETAL® Inc., Latrobe, Pa.

KENTANIUM

HEAT-RESISTANT, HIGH-STRENGTH, LIGHTWEIGHT CEMENTED TITANIUM CARBIDE

3-48

SALES OFFICES IN PRINCIPAL CITIES



4 reasons why customers want Westinghouse Gearmotor Drive

Add sales points to your product. Westinghouse Gearmotors, with the exclusive horizontal split case, have many design advantages for you and your customers. Four such benefits are pictured above . . . here's the story behind each!

1. **Case cover quickly lifted** after removing a few bolts. No need to dismount motor, break coupling to driven load or drain oil! All servicing can be done in confined work area.
2. **No intricate subassemblies** exist in Westinghouse Gearmotors. Once case cover is removed, all gearing parts are free for removal. No further dismantling required for gearing maintenance.
3. **Firm bearing support** is assured. Bearings are anchored directly to case foundation, not in subassembly discs or spiders. Machined shoulders hold horizontal thrusts to exact tolerances . . . undue tooth wear and vibration are eliminated.
4. **4.78 minutes to dismantle** a Westinghouse Gearmotor! Each step of dismantling operation was "stop-watch timed". Included in study was time required for removal of end cap, motor, gears and pulling of pinion. Total time required . . . 4.78 minutes; a record that withstands any comparison!

Pass these advantages on to customers. Specify Westinghouse Gearmotors in your machine design. Write for free booklets—*Gearmotors* B-5645; *Speed Reducers* B-5646—to: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-07340

YOU CAN BE SURE...IF IT'S Westinghouse

KEEP INFORMED — NEW EQUIPMENT, BUSINESS NOTES, LATEST CATALOGS

Turbine Speed Control

Elliott Co., Jeannette, Pa. has published a new 30-page Wire-O bound bulletin, H-21, on "Fundamentals of Turbine Speed Control." It is illustrated and intended to clarify the operation of common types of automatic speed control for steam turbines. An introductory section covers general fundamentals of automatic control systems, and includes a key to control terminology, giving equivalent terminology used in connection with instrument and regulator applications. Simplified diagrams in three colors illustrate operating principles of actual control systems.

Ball Valves

S. Morgan Smith Co., York, Pa., has issued an eight-page brochure in color on its new line of manually-operated Smith Ball Valves, said to be the first being offered in sizes from 12 in. to 48 in. for shut-off service at pressures up to 150 psi, for water works and industrial applications. The manual Smith Ball Valves are designed for 150 psi working pressure with 125 psi, ASA flanges (C.I.).

Principal technical section of the bulletin, Bulletin 159, concerns valve characteristics with sub-sections on closing conditions, tightness of closure, leverage, the operating mechanism, and optional end sections. Other pages have front view assembly and sectional assembly drawings, with descriptions of standard settings, sectional assembly, and principal parts lists.

Spring Pin Folder

A new folder illustrating the versatility of its Sel-lok spring pin in a wide variety of applications has been prepared by the Standard Pressed Steel Co., Box No. 558, Jenkintown, Pa. Typical applications pictured in the folder are as axles in caster assemblies, as keys in gear assemblies, as lock pins in door handles, as hinge pins, as fasteners holding laminated sections together, as stop pins and as cotter pins. Dimensions of standard and light-duty Sel-lok spring pins, their shear strength and recommended minimum and maximum hole sizes to accommodate them, are given in the folder.

Plant Water Needs

"Sources of Water," a new six-page folder issued by Hall Laboratories, Inc., Hagan Bldg., Pittsburgh 30, Pa., discusses basic water-procurement problems, and cites examples from industrial experience in meeting plant water requirements. It shows how a critical water supply problem at an eastern steel plant was solved when a survey showed that effluent from a near-by waste treatment plant could be used for certain process applications. Re-use of the waste water reduced source water requirements to the point where the supply was adequate, the company says.

KEEP INFORMED

NEW EQUIPMENT
BUSINESS NOTES
LATEST CATALOGS

Electric Fork Truck

"Electri-Facts," new 16-page illustrated brochure offered by the Clark Equipment Co., Battle Creek, Mich., presents a thorough exploration of its electric fork truck line. Construction features of the machine are interpreted through the use of schematic drawings. The brochure has a special illustrated section on fork truck attachments, ranging from overhead guards to snow plows.

Heat Exchanger Tubes

Aluminum Company of America, Pittsburgh, Pa., has announced a new booklet which presents the complete story on aluminum heat exchanger tubes, emphasizing factors that provide the combination of low cost and corrosion resistance.

The 24-page, two-color booklet, "Alcoa Aluminum Heat Exchanger Tubes," covers the economics of using heat exchanger tubes, types of tubes, corrosion protection provided by cladding, service and laboratory experience in the use of aluminum heat exchanger tubes with cooling waters, and applications of aluminum exchangers in the petroleum, petrochemical, chemical, and related industries.

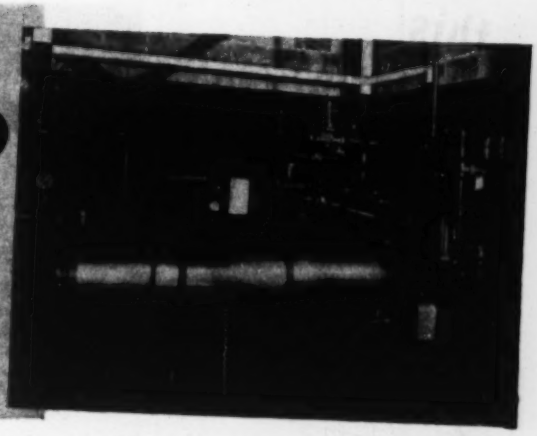
Demineralization Bulletin

A new, 24-page bulletin, WC-111, is now available from Graver Water Conditioning Co., 216 W. 14th St., New York 11, N. Y. Chemical and mechanical factors entering into the design and operation of demineralizing plants for obtaining the highest quality process water and boiler feedwater from a wide range of water supplies and under many different operating conditions are explained.

Removal of ionized, dissolved solids from water by means of ion exchange, and the application of demineralizing to low-makeup and high-makeup boiler plants are described. The booklet contains a section concerned with estimating chemical operating costs of various demineralizing systems, as well as material on the characteristics of two-bed demineralizers with and without silica removal, and a mixed-bed demineralizer with silica removal. A two-page chart presents diagrams of six modifications of these three basic types, and their applications and relative advantages. There is also a discussion of carbon dioxide removal by degasification.

GIVE ENOUGH
SOON ENOUGH

2 ENCO FUEL OIL UNITS in this plant



Here is a typical 2 unit installation of Enco fuel oil pump sets—selected to take care of all the requirements of a building materials manufacturer.

The Large Unit has 2 pumps and 2 heaters, completely automatic and arranged for operation with either heater, or either pump—or both. With one heater and pump the capacity is 11 gpm Bunker C oil at 300 psig pressure, and temperature rise from 90F to 230F.

The Small Unit is for cold starting up—has no heater. The capacity is 3 gpm of No. 2 oil at 300 psig pressure.

All Enco sets are individually designed, each for specific plant conditions—for easy installation, low maintenance and minimum carefree operation.

Complete details including the 10 important features of Enco fuel oil heating and pumping sets are given in Bulletin OB53. Copies gladly sent upon request.

THE ENGINEER COMPANY, 75 West Street, New York 6, N. Y.
In Canada: Rock Utilities Ltd., 80 Jean Talon St. W., Montreal, P. Q.
Palser Enterprises, 378 York St., London, Ontario
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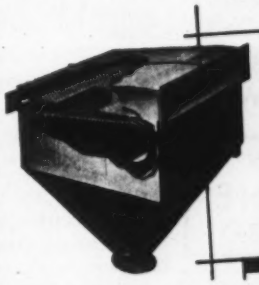
For Larger-Boiler Fly Ash Collection and Valuable Dust Recovery



Solves Big Problem for Small Boiler Operators!

BUELL 'SF' ELECTRIC PRECIPITATOR

BUELL MECHANICAL CYCLONE SYSTEM

Buell 'LR' Collector gets 99% of all 100-mesh and larger cinder discharge. Top efficiency for boilers from 100 to 2000 BHP.

Draft loss so low you can use 'LR' on the smallest natural draft boilers.

Get all the facts—write for 'LR' Bulletin. Buell Engineering Company, Dept. 43-G 70 Pine Street, New York 5, New York.

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Engineered Efficiency in
DUST COLLECTION

this Bulletin...

THE "INSIDE STORY" ON THE GREATEST PROGRESS IN SAFETY VALVES FOR OVER 50 YEARS!

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LONERGAN
UNI-LINE
41-W-200 SERIES

NO OTHER VALVE LIKE IT

The UNI-LINE features:

- a *Much Higher* capacity per size, than any other safety valve.
- a free-acting, self-aligning disc.
- a "*floating guide*" (readily adjustable for control) . . . assists in opening and closing action, as well as affording an additional self-aligning feature.
- a Disc and Disc holder of *forged copper* alloy, not castings.

For full details about the money-saving, maintenance-free advantages of these "features," plus valve data and specifications, write for your free copy of this new UNI-LINE 41-W-200 Series Bulletin.

Lonergan

J. E. LONERGAN COMPANY

Established 1872

213 RACE STREET PHILA. 6, PA.

KEEP INFORMED

Lift Catalog

Lee Engineering Co., Pawtucket, R. I., announces the availability of a new catalog listing dimensions and illustrating all models of the company's Presto hydraulic lifts. The company says there are 20 basic models, in addition to lifts manufactured for special applications. Platform and fork lifts are available in both foot-operated and battery-operated models. Capacity of all lifts is 1000 lb, the company says.

Materials Handling Trailers

A bulletin describing the Mercury Type A-310 trailers, which are used in materials handling towed by materials-handling trucks, has been issued by Mercury Mfg. Co.

The four-page, two-color bulletin discusses the many advantages of the A-310 castor steer trailer. Copies of Bulletin A-100 are available from Mercury Mfg. Co., 4044 S. Halsted St., Chicago 9, Ill.

'O' Ring Packing Data

An eight-page catalog on Vix-Syn "O" ring packings, gaskets and leather back-up washers is available from E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa. The catalog contains tables and illustrations of standard size packings specially molded of homogeneous synthetic rubber and primarily recommended for reciprocating motion.

Paving Breakers and Air Tools

Two bulletins describing their latest models of paving breakers and air tools for construction and plant maintenance work have been announced by Gardner-Denver Co., Quincy, Ill.

Bulletin PB-1 gives the features and specifications on Gardner-Denver heavy-duty, medium-weight, and light-weight paving breakers. It also describes the sheeting driver, pin driver, and spike driver attachments, and other tools for use with these paving breakers.

Bulletin ST-100 describes and gives the specifications for Gardner-Denver clay spaders, trench diggers, and single pad and triplex backfill tampers.

Universal Testing Machine

Two Baldwin-Tate-Emery universal testing machines of 20,000- and 60,000-lb capacity are described in four-page Bulletin 4213, announced by Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa. Principles of their hydraulic straining system and the Tate-Emery null method load indicator are given along with descriptions of accessories and specifications.

These machines are designed for use where the ratio of high range to low range need not be greater than 20/1, and where accuracy within $\frac{3}{4}$ per cent of reading or 0.15 per cent of range is adequate.

Did you know that binders are available for your sets of

ASME CODES AND STANDARDS

These binders give every advantage of a bound book together with the added convenience which comes from the ability to insert, remove or transpose sections of the contents. They are provided with flexible steel rods which slip out and under the top and bottom metal lips, the latter being riveted through the backbone.

For Boiler and Pressure Vessel Codes, the binder is 9" × 12" in size, has a 3½" capacity, is made of green cloth and has the title imprinted on backbone in aluminum foil. **$3.25**

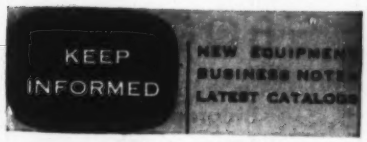
For Standards and Power Test Code, binder is 9" × 12" in size, has a 3" capacity, is made of blue cloth with identifying imprints on backbone stamped in gold. **$3.25**

For ASME Boiler Code Interpretations a two-ring binder is available. Its size is 5½" × 8"; capacity, one inch; it is made of green cloth and has title stamped in gold on front cover. **$2.00**

20% Discount to ASME Members

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

29 W. 39 St., New York 18, N.Y.



Pipe Insulation

A 16-page technical data manual on Gilsulate insulation for insulation and protection of hot underground pipes is available from American Gilsonite Co., Salt Lake City, Utah. The manual describes the grade of Gilsulate, and includes data and specifications, design methods, design procedure, resistance factor nomographs, the temperature gradient and size of Gilsulate structure. Gilsulate is described by the company as offering a positive solution to the difficult problem of insulation and corrosion protection of hot underground pipes.

Supercharger Bulletin

A four-page bulletin, No. 153, describing Miehle-Dexter superchargers for internal combustion engines and blower and air compressor operations is available from Miehle-Dexter supercharger division of Dexter Folder Co., 100 4th St., Racine, Wis. The bulletin also contains selection graphs showing various models performances in terms of cfm vs. rpm and cfm vs. hp.

Remote Pressure and Level Indicators

"Chronoflo Level and Pressure Telemeter," Bulletin 230-K10 of Builders-Providence, Inc., Div. of B-I-F- Industries, Inc., Providence, R. I., describes the application of Chronoflo Telemetering to level control in reservoirs and elevated and ground storage; to pressure control in pump discharge lines, distribution systems, booster stations, industrial processes, and steam and gas lines; and to automatic pump control.

The eight-page bulletin includes features, description, and illustrations of the transmitters and receivers, and diagrams of installation arrangements, together with explanatory material on application and operating features.

A copy of Bulletin 230-K10 is available on request from Builders-Providence, Inc., 345 Harris Ave., Providence 1, R. I.

INCREASE THE EFFICIENCY OF YOUR
AIR HANDLING SYSTEM...

INSTALL
the
Standardaire® Blower

The *Standardaire* Blower moves more air . . . with less wear, maintenance and power cost than blowers of equal weight and size.

By employing a proved principle of compressing air on a modified adiabatic cycle, the *Standardaire* Blower provides a wide range of pressures with a minimum of internal losses. The cycloidal form, screw type rotors draw the air in and discharge it smoothly without shock from the pockets which form between the precision machined rotors.

Write today for further information.

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CORPORATION

BLOWER-STOKER DIVISION
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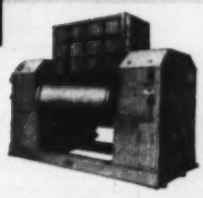

Read Standard also manufactures a complete line of chemical mixers for laboratory and industrial use. For information write, Read Standard Corp., York, Pennsylvania

INCREASE PRODUCTION... DECREASE COSTS WITH THESE LOW COST PRODUCTION TOOLS

Use CHROMALOX Electric Heaters to heat liquids, air and gases. Use them to heat platens, dies, molds and moving metal parts. Use them anywhere you want fast, economical and easy-to-control heat for production line processing. CHROMALOX Heaters are simple to install, efficient, come in types, sizes and ratings for working temperatures up to 1100° F. Most are available from stock.

FOR IDEAS ON HOW TO USE CHROMALOX HEATERS

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7646 THOMAS BLVD., PITTSBURGH 8, PA.
Send me the illustrated booklet "101 Ways To Apply Electric Heat." I D 31-A
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Company_____
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CHROMALOX
THE BEST IN ELECTRIC HEAT

KEEP INFORMED — NEW EQUIPMENT, BUSINESS NOTES, LATEST CATALOGS

Pressure Seal Bulletin

Bulletin No. 7, describing Sealol, a balanced pressure seal, is available from Sealol Corp., 45 Willard Ave., Providence 5, R. I. The eight-page booklet includes descriptions of types of seals, along with installation and design data and typical installations.

Structural Material

Bondolite, a high-strength, lightweight sandwich structural material made by Goodyear Aircraft Corp., is described and illustrated in a 32-page brochure published by the company's sales division, Akron 15, Ohio. Originally developed for use in aircraft structures, Bondolite's versatility creates unlimited applications in other fields, such as air, marine, rail and automotive transportation, building and furniture construction, the company says.

A-C Motor-Frame Comparison Chart

The Reliance Electric & Engineering Co. has produced the Compar-A-Frame chart to aid engineers and designers in comparing the old and new NEMA a-c frame assignment standards.

The single-page Compar-A-Frame chart shows comparative dimensions of open-type and fan-cooled-type polyphase induction motors. There are sub-charts for comparing frame sizes according to horsepower and speed, and a chart for comparison of dimensions of the old and new frames. For reference there are two simplified motor outlines to give essential dimensions key to letters.

The Compar-A-Frame chart is printed on one side only on light-weight cardboard and is punched for insertion in looseleaf binders. Requests for these free charts will be honored by Reliance Electric & Engineering Co., 1088 Ivanhoe Rd., Cleveland 10, Ohio.

Industrial Water Treatment

More than a dozen water-treatment processes are discussed in Rohm & Haas Co.'s 24-page booklet entitled "If You Use Water".

Illustrated with two-color flow diagrams, the booklet covers the fundamentals of the three major classifications of industrial water treatment based on ion exchange: softening, dealkalization, and deionization. Under each of these classifications, the booklet presents the major process variations. For example, the deionization section describes multiple- and mixed-bed systems and why different types of water supplies require different combinations of ion exchange resins and equipment to produce effluent water of a given quality.

The advantages of the various water treatment methods are discussed and interpreted in terms of the applications in specific industries. Copies of the booklet may be obtained on request to Rohm & Haas Co., Resinous Products Div., Washington Sq., Philadelphia 5, Pa.

BOOKS

in the ASME Biographical Series worth reading.

I Remember

AN AUTOBIOGRAPHY BY DEXTER S. KIMBALL

Emeritus Professor of Mechanical Engineering at Cornell University. Past President of The American Society of Mechanical Engineers.

This is the vital story of a dynamic era and the equally engrossing story of an intrepid leader in industry, engineering, and education. What Dean Kimball remembers ranges from the San Francisco of the eighties to the college campus of today, and from engineering education to engineering practice. Also reflected is his outstanding work with the War Production Board in Washington, and his guiding roll in the expansion of Cornell and its establishment as a great engineering school.

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Adventures

IN THE NAVY, IN EDUCATION, SCIENCE, ENGINEERING, AND IN WAR—BY W. F. DURAND

Past President of The American Society of Mechanical Engineers.

Here Dr. Durand records what he considers to be the most interesting and important events of his life. They include his researches at Cornell on the performance of ship propellers, the aeronautical engineering problems which engaged his attention at the NACA where he served as its first chairman and in other capacities for nearly thirty years, and his activities after his retirement from Stanford University as consultant on the Hoover Dam and other similar projects and as a leading participant in the encyclopedic summary of Aerodynamic Theory.

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20% DISCOUNT TO ASME MEMBERS

These autobiographies are warmly recommended for their vivid portrayal of two pioneers at work and for the interesting picture they reveal of expanding technology in two important fields.

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
29 West 39th St., New York 18, N.Y.

Rivet Selector

A slide-card rivet selector said to contain information heretofore available only direct from manufacturers is being offered free by Milford Rivet & Machine Co., Bridgeport Ave., Milford, Conn. The selector gives complete dimensional information on extruded, drilled, bifurcated and male and female cutlery rivets. It also contains the clinch allowance and clearance hole size of rivets.

Please show this to a highly capable

Product-Design Chief Engineer

who is ready for his lifetime opportunity

We are enlarging our line, and need a Chief Engineer who is competent to head up three important departments: General Engineering, New Product Development, Testing Laboratory.

He must be a mechanical engineer with experience in electrical and metallurgical design problems, preferably of products such as electrical conductor fittings, which is one of our lines.

Experience in testing mechanical and electrical devices will be valuable, as one of his first duties will be supervising the equipment of a new laboratory being built for testing conductor fittings and other electrical equipment.

This opportunity is exceptional, for a man who can measure up to its requirements. Authority will be commensurate with responsibility. As Chief Engineer he will be a member of our top-management team, and as such will be compensated by a combination of base salary and executive bonus.

If you know someone who measures up to this opportunity, please have him write us giving complete information including age, education, and full details of experience. All replies will be held in strictest confidence. If qualified, a personal interview will be arranged either in the applicant's city or at our plant. Our employees know of this advertisement.

Address CA-4736 % "Mechanical Engineering

Forging Movie

A 16 mm, 33-minute color and sound movie, "Forging in Closed Dies," is available on loan from Drop Forging Association, 605 Hanna Bldg., Cleveland 15, Ohio. The film shows steam and air lift hammers, board hammers, mechanical and hydraulic forging presses and upsetters in action. It covers familiar forgings, both completed and in process, and shows the entire process of forging, from the steelyard through making of the dies to the finished drop forging.

Mixed-Bed Demineralization

An eight-page bulletin, No. 3983, detailing the many advantages of mixed-bed demineralization has been made available by The Permutit Co., 330 West 42nd St., New York 36, N. Y. The booklet recites practical experiences and the economy of operation in utilizing the first fully automatic mixed-bed equipment to produce make-up water, gives a complete operating description of the process, and shows installed equipment together with a schematic diagram of the demineralizer control arrangement.

Quick-Seal Couplings

A 16-page catalog on Titeflex Quick-Seal couplings is available from Titeflex, Inc. Hendee St., Springfield 4, Mass. The company says the couplings are available in an unlimited range of sizes to handle all materials. They are designed for leak-proof performance, with full swivel action and are said to need no tools for coupling or uncoupling.

Carbon Products Manual

A 12-page manual on application and design using Morganite carbon products is available from Morganite, Inc. 33-12 48th Ave., Long Island City 1, N. Y. The booklet lists specifications of common grades of the material and includes typical applications of it in general purpose bearings, cam thrust bearings, aircraft fuel seals, meter ring disc assemblies, valve seats, bearing seals, automotive seals and piston rings.

Guide For Power Tubes

A guide to Reliatron power tubes to serve design engineers, maintenance technicians, and experimenters is available from the Westinghouse Electric Corp. The 12-page booklet contains characteristics and ratings of over 150 tube types.

Rectifiers, phototubes, amplifiers, modulators, oscillators, and other miscellaneous types for use in industry and radio are described. An interchangeability chart lists the Westinghouse type that directly replaces each of approximately 225 tubes of other manufacturers.

Copies of this booklet, 86-020, cost 15 cents each, from Westinghouse Electronic Tube Div., Dept. T-056, Box 284, Elmira, N. Y.

FORWARD!

by

LUBRIPLATE LUBRICANTS

The introduction of LUBRIPLATE Lubricants established a new high standard for industrial lubrication. Now, a recently patented improvement in the production of LUBRIPLATE results in even greater lubrication efficiency. Under today's operating costs, reduction of down time, less parts wear and replacements, as well as lower power consumption, far outweigh any differential in the initial cost of LUBRIPLATE Lubricants.

For nearest LUBRIPLATE distributor see Classified Telephone Directory. Write for your free copy of the new and enlarged LUBRIPLATE DATA BOOK—a most valuable treatise on modern lubrication!

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Fiske Brothers Refining Co.
Newark 5, N. J. • Toledo 5, Ohio

KEEP INFORMED

NEW EQUIPMENT | BUSINESS NOTES | LATEST CATALOGS

Refractories Manual

A 32-page manual on refractories is available from Norton Co., Worcester 6, Mass. The booklet deals with the application and suggested uses of "Crystdon" silicon carbide refractories in walls and boilers of all types. Also included are curves of the thermal conductivity and thermal expansion of various refractories and air flow through air-cooled blocks. Tables listing brick specifications, a temperature conversion chart and a quick-figuring efficiency chart for boilers are also included.

Pressure Transducer

A 12-page bulletin, No. PT-1, describing instruments for the measurement of gage, differential, and absolute pressures, is now available from Statham Laboratories, Inc., 12401 W. Olympic Blvd., Los Angeles 64, Cal.

The transducers are based on the principle of the Statham unbonded strain gage which translates pressure into an exact electrical analog output by means of a complete balanced bridge of strain-sensitive resistance wire. The bulletin includes drawings, specifications, and selection tables for eight designs for pressure measurements from 0–0.05 to 0–10,000 psi.

Metering Pumps

A new bulletin has been issued by the Hills-McCanna Co., 3075 N. Western Ave., Chicago 18, Ill., which describes its line of "K" type metering and proportioning Pumps. The bulletin explains the operation of the pump, illustrates its design features and gives complete capacity and pressure information on the entire line. The "K" type pump is a completely enclosed in-line, direct acting, hydraulic drive pump with built in pressure relief valves and adjustment while in operation, the company says.

Material Processing

A new 20-page booklet, No. 2511, describing Roto-Louvre is available from Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. The Roto-Louvre is said to be capable of processing large quantities of material with a uniform result. Agitation is so gentle that degradation of friable materials is reduced to a minimum, the company says. It has been used to process more than 200 materials including food and chemical products, sand, fertilizer, yeast, sugar and apple pomace. The listings in the booklet include aluminum chips, coffee, coke, crystals, fertilizers, filter cake, sugar, slurry and soaps.

Welding Stainless Steels

A bulletin on the welding and metallurgical aspects of stainless steels has been announced available from the General Electric Co., Schenectady 5, N. Y.

Special Products Booklet

A 20-page booklet describes the technology, ability and facilities of the special products division of I-T-E Circuit Breaker Co., 601 E. Erie Ave., Philadelphia 34, Pa. The booklet, which is available from the company, traces the division's growth in the fields of radar, jet engines, guided missiles, and television, and is illustrated with photos of key division personnel and the division's manufacturing facilities.

Package Water Conditioner

Bulletin 3869, eight pages, describing Permutit's Package Water Conditioning Plant, said to be a versatile, self-contained unit, designed to coagulate, clarify, neutralize de-alkalize and soften raw water supplies, has been announced as available from the Permutit Co., 330 W. 42nd Street, New York 36, N. Y. Component parts, principles of operation, ratings, capacities, and sizes eight different models are listed.

Important

NEW REFERENCE DATA

on the complete line of Lenape pressure vessel connections, manways, necks, nozzles, etc.

Write today on your company letterhead reserving your copy of Lenape Catalog 1053.

84 pages of quick answers at your fingertips.

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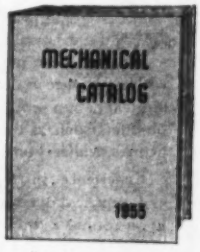
to reserve your

FREE 1955 MC!



As an ASME member, you recently received a Request Card to be filled in and returned if you wish to receive a copy of the 1955 Mechanical Catalog. Distribution is limited so don't delay returning your card at once. In addition to its comprehensive directory of over 40,000 listings, it contains thousands of detailed product descriptions provided by hundreds of leading manufacturers. Now in its 44th year, Mechanical Catalog is the super market for mechanical engineers. It gives you product facts fast, up-to-date, accurate. If you did not receive your MC Request Card, use your letterhead to reserve a copy right away.

MECHANICAL CATALOG

Published annually as a service to members by

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

29 West 39th Street, New York 18, N. Y.

KEEP INFORMED

NEW EQUIPMENT
BUSINESS NOTES
LATEST CATALOGS

Drive Turbine Bulletin

Elliott Co., Jeannette, Pa., has issued a new 16-page Bulletin, H-22, on its Type YR mechanical drive turbine. The bulletin gives emphasis by large, detailed illustration to design features and proper control of mechanical drive turbines. Modifications, specifications, and dimensions are detailed.

Electric Actuators

A 64-page catalog of electric actuators made by AiResearch Mfg. Co. has been published. The descriptive booklet outlines the applications and specifications of 20 basic types of linear and rotary actuators, power units, jacks, gear boxes, and ammunition boosters. The company manufactures some 300 different models in these fields.

Illustrated with photographs, charts, and engineering drawings, the booklet is designed to help potential users choose the model that will best suit their needs. Copies can be had from AiResearch Mfg. Co., Los Angeles 45, Cal.

Aluminum Electrical Conductor

The development of aluminum electrical conductors by Aluminum Co. of America is described in "Alcoa Research and Progress In Electrical Conductors," a 20-page booklet published by Alcoa. Alcoa's concentration of electrical conductor research facilities and equipment at its Massena, New York, Electrical Conductor Laboratory is highlighted in pictures.

The booklet includes listings of Alcoa's technical reference material on aluminum conductors. Copies may be procured through Alcoa Sales Offices or from Aluminum Co. of America, 725 Alcoa Bldg., Pittsburgh 19, Pa.

Data Card on Tubing Steel

A technical data card issued by the Tubular Products Div. of The Babcock & Wilcox Co., known as TDC 151, discusses B&W Croloy 9M (8 to 10 per cent chromium, 1 per cent molybdenum).

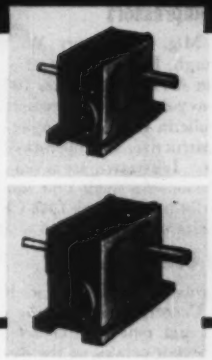
Tube life of 40,000 to 100,000 stream hours or more is claimed even under severely corrosive conditions. The steel will be considered by B&W as a substitute for the more expensive stainless grades, especially with regard to sulfide corrosion as encountered in oil refineries.

Because of its resistance to steam oxidation, B&W Croloy 9M is said to be a suitable material for steam superheaters. Included in the bulletin are data on mechanical and physical properties, bending, welding, and heat treatment. Copies of Bulletin TDC 151 are available on request from the company's offices at Beaver Falls, Pa.

Use a CLASSIFIED ADVERTISEMENT
For QUICK Results

Packaging 15 products per minute in sanitary, see-through "skins"

...STOKES & SMITH STRETCHRAP MACHINE USES 2 WINSMITH SPEED REDUCERS



Wrapping tight, wrinkle-free "skins" of transparent Pliofilm to the contours of meats, cheeses, fruits, vegetables, toys, soap, etc., the Stokes & Smith Stretchrap Machine packages up to 15 odd-shaped products per minute.

Fed from a roll, the Pliofilm is first heated, then stretched and drawn by vacuum into a pocket to receive the product. Driving the cam shaft that actuates the air valves controlling the operation of the machine is a motor-powered, Winsmith Worm Gear Speed Reducer, Model 2 DB, with an input speed of 1350 rpm and a reduction ratio of 25:1.

Carrying a steady stream of contour-wrapped products from the machine, the conveyor is driven by another Winsmith Reducer, Model DB, which is powered by the same main drive 3 HP motor. With an input speed of 1440 rpm, it operates at a 50:1 reduction ratio.

In stressing advantages of Winsmith Reducers, Stokes and Smith Company states, "They have worked in nicely with our space limitations."

Compactness, coupled with ruggedness, have been key factors in establishing the Winsmith name, *plus this fact:* The Winsmith line fulfills any speed reduction need throughout the 1/100 to 85 hp range in ratios from 1.1:1 to 50,000:1. Request Catalog 148 for details.

WINSMITH, INC.
333 June St
SPRINGVILLE (Erie County), N. Y.

EQUIPPED WITH

WINSMITH SPEED REDUCERS

KEEP INFORMED

NEW EQUIPMENT | BUSINESS NOTES | LATEST CATALOGS

Air Compressors

Joy Mfg. Co., Henry W. Oliver Bldg., Pittsburgh, Pa., has released a new 36-page Bulletin A-72 on Joy Series 100, Class WN-114 heavy-duty air compressors for industry. The bulletin contains complete information on construction and operation of the compressor. Illustrated are seven models of the compressor as a single unit for displacement capacities from 1186 to 1948 CFM as well as twin units which furnish up to 3896 CFM.

Lathe Centers

Information on the new Red-E Turret Lathe Center, as well as the complete line of bull and pipe nose centers, is furnished in the recent catalog of the Ready Tool Co., Bridgeport, Conn.

Specifications and prices of the Red-E Turret Lathe center are included with illustrations. The center is furnished in sizes ranging from $1^1/_2$-in. to $2^1/_2$-in. shank diameter with head sizes from $2^7/_8$ in. to $5^1/_8$ in. The anti-friction standard light- and medium-duty centers, shank-type extra-heavy-duty centers, and ball-and-roller-type extra-heavy-duty centers are also covered. The catalog is obtainable from the Ready Tool Co., 554 Iranistan Ave., Bridgeport, Conn.

Water Conditioning Data

The Permutit Co., 330 W. 42nd St. New York 36, N. Y., has issued Data Book No. 2478A, a 108-page compilation of data for the convenience of practicing engineers and those who work with water conditioning problems. Information on such subjects as hydraulics, impurities in water, chemicals used in water treatment, ion exchange resins, specific gravities of fluids, and chemical reactions are covered.

Unit Heaters

Bulletin No. 543-B, released by the Heating Dept. of Dravo Corp., 1203 Dravo Bldg., Pittsburgh 22, Pa., illustrates a line of commercial and industrial, gas-fired, warm-air unit heaters having output capacities of 88,000 to 160,000 Btu per hr.

The four-page folder describes the two types: one for suspended mounting and one that can be built into duct-type heating or air-conditioning systems. Also included are tables listing heating and air delivery capacities, outlet temperatures, air pressure drops, and weights and dimensions of the different units. All models are approved by the American Gas Association for use with natural, mixed, or manufactured gases, the company says.

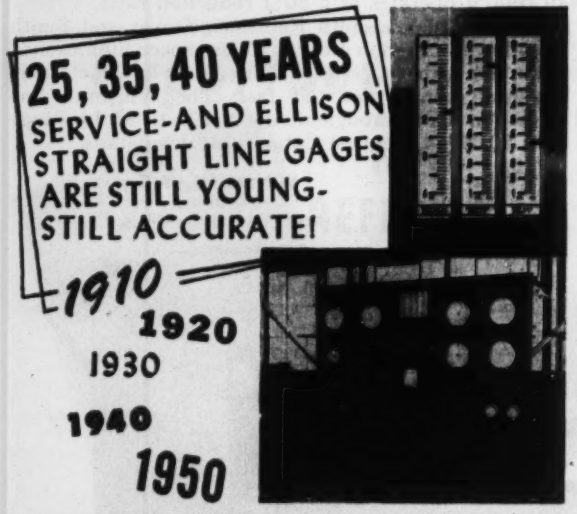
Production Control Manual

Remington Rand, Inc., 315 4th Ave., New York 10, N. Y., has available a 56-page manual, "Production Control Systems and Procedures," designed as an aid to plant and office management. The illustrated booklet covers engineering records, procedures, classification, numbering systems, bills of materials, operation sheets, development of a production forecast, materials control, scheduling, production, and tool control.

Pressure-Regulating and Relief Valves

A 24-page catalog covering 18 models of its pressure-regulating and relief valves has been published by the Schade Valve Mfg. Co. Sizes are in several ranges from $^1/_2$ in. to 12 in.

A descriptive index summarizes recommended duty, service, sizes, pressures, maximum temperatures, inner trim, actuation, and loading for each style. Two pages are devoted to valve selection, including several examples and three tables. Dimensions, weights, and cutaway drawings are provided for all of the styles in the catalog. Requests should be directed to the Schade Valve Mfg. Co., 2527-37 N. Bodine St., Philadelphia 33, Pa.

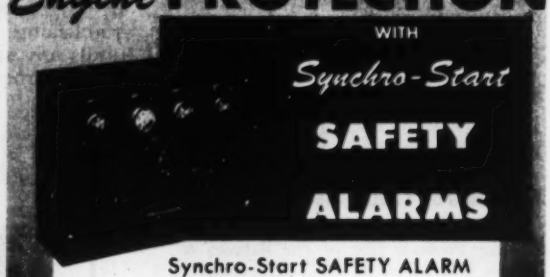


Reports from the field indicate that many of the first ELLISON Straight Line Draft Gages installed are still giving highly satisfactory performance. Ellison Gages give accurate readings—non-parallax pointers. Long lasting, positive, highly responsive mechanism. Bell type or Diafram type. Models for any panel board arrangement. Send for Bulletin 122—Bell type; Bulletin 124—Diafram type.

ELLISON DRAFT GAGE CO., INC.
542 W. MONROE ST. Since 1906 CHICAGO 6, ILL.

The Ellison Line Also Includes:
Draft Gages, Bell and Diafram—Inclined Draft Gages—Portable Inclined Vertical Tube Gages—Vertical Tube Gages—Oil, Heavy Liquid and Mercury—Single and Multi-Tube-Saturator Gages—U Gages—Stationary and Portable—Air Filter Gages—Dial and Inclined Tube Types—Pitot Tubes—U Path Steam Calorimeters—Portable Gas Analyzers-Orsat Type

Engine **PROTECTION**
WITH
Synchro-Start
SAFETY ALARMS



Synchro-Start SAFETY ALARM SETS automatically warn with visual and audible signals as soon as such conditions as low oil pressure, low air pressure and overheating, etc. occur.

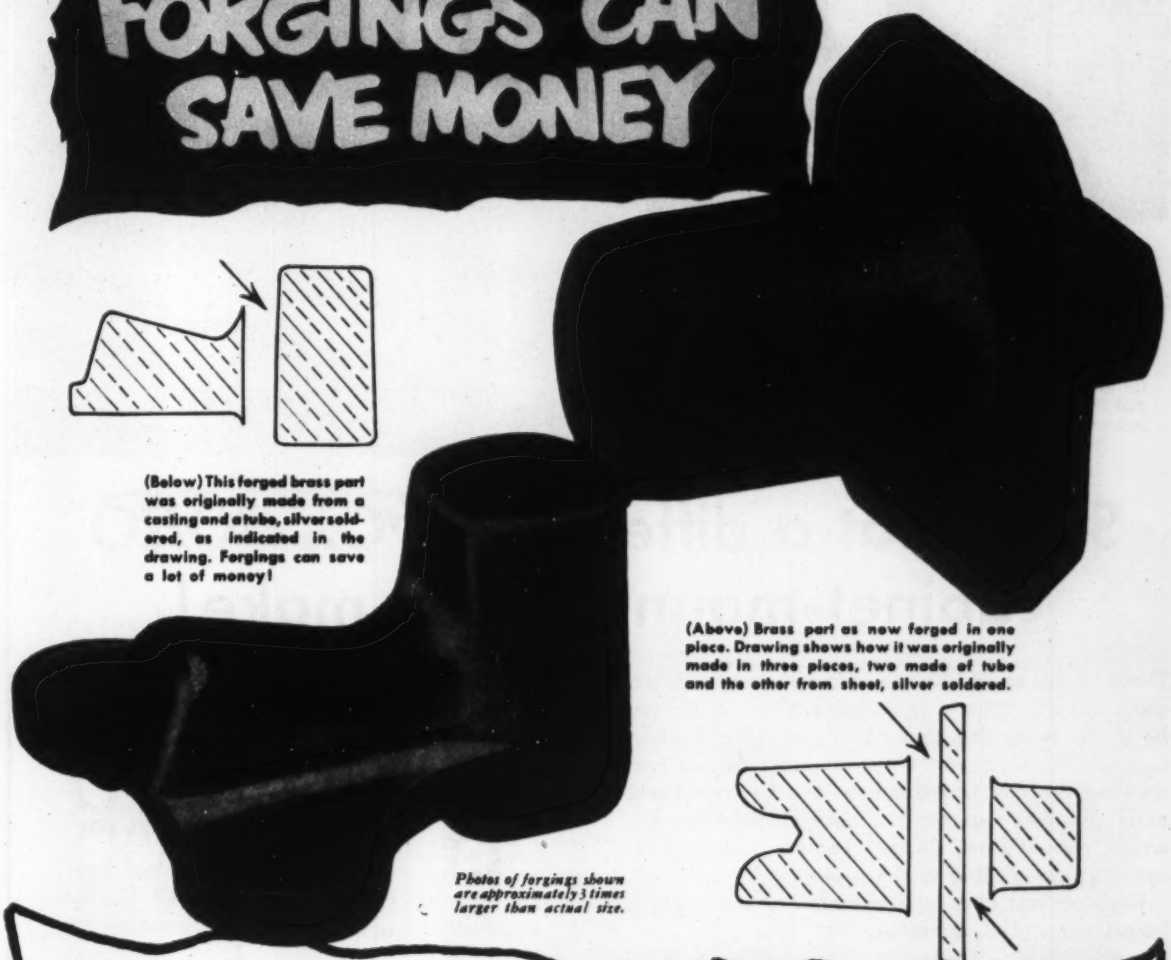
Three switches are provided—control "on-off"—test—audible alarm cut-off. For added protection these alarm sets may be equipped with automatic shut-down in case signals are not heeded.

Further information upon request.

SYNCHRO-START PRODUCTS
INCORPORATED
8151 N. RIDGEWAY AVE. • SKOKIE, ILL.

See How FORGINGS CAN SAVE MONEY

(Below) This forged brass part was originally made from a casting and a tube, silver soldered, as indicated in the drawing. Forgings can save a lot of money!



(Above) Brass part as now forged in one piece. Drawing shows how it was originally made in three pieces, two made of tube and the other from sheet, silver soldered.

Photos of forgings shown are approximately 3 times larger than actual size.

The two brass parts shown here were originally built up out of separate pieces, silver soldered together. That was the difficult and expensive way. Then the manufacturer and Revere worked together to see if forgings could not be used. Designs and dies were worked out, and for a number of years Revere has kept a steady flow of these parts going to the customer. He reports that the forgings not only save money, but are superior: stronger, more dense, with a better finish, and machining is faster and easier.

If you have sub-assemblies made of several parts, look into forgings. They may offer important economies. Revere makes forgings in copper and its alloys, and aluminum alloys. See the nearest Revere Sales Office.

REVERE

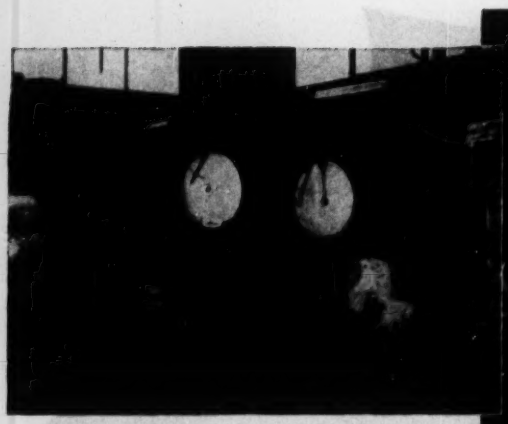
COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

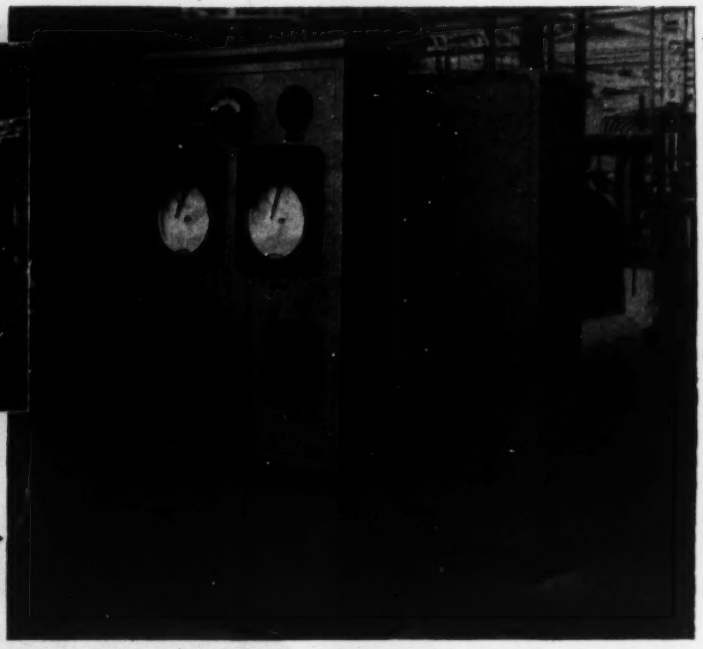
230 Park Avenue, New York 17, N. Y.

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y. Sales Offices in Principal Cities. Distributors Everywhere.

SEE "MEET THE PRESS" ON NBC TELEVISION, SUNDAYS



This is part of an old-fashioned installation which lacks the convenience and efficiency of modern instrumentation.

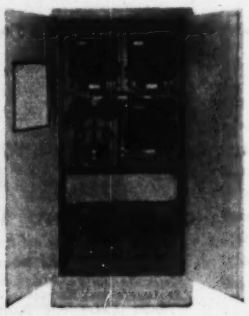


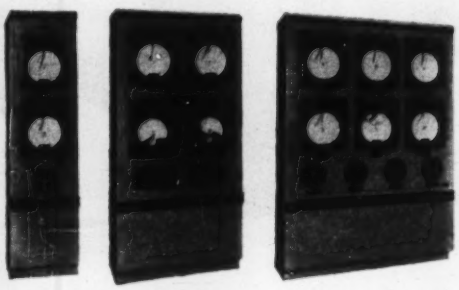
Compare this centralized Foxboro Cabinet installation of similar instrumentation, which saves time for the operator, makes his work more efficient, and gives maximum protection to the precision instruments required for his process.

See what a difference FOXBORO cabinet-mounting can make!

These photos show at a glance how much more efficient and attractive your instrument installation can be if it's integrated and centralized in a Foxboro Cabinet. Not only are the instruments protected from dust and process "atmospheres", but they're conveniently grouped together for more efficient use and easier maintenance. Those "endless steps" of the operator are a thing of the past!

Foxboro will supply a cabinet (or cabinets) to house and protect any number of existing instruments and related devices. Or your order for new instruments can be shipped to you already mounted in cabinets, completely piped and wired, needing only simple power and process connections to be put into operation. Write for illustrated and informative Bulletin 413.





Foxboro Cabinets are available in three standard sizes for 2, 4, or 6 conventional-size instruments (or equivalent). For mounting more than 6 instruments, Foxboro Sectional Cabinets (with open ends) are used . . . bolted together to form desired length. End sections have one closed side to form dust-tight enclosure. Exclusive insert-type panel construction permits easy conversion when process changes so require.

THE FOXBORO COMPANY, 967 NEPONSET AVENUE, FOXBORO, MASS., U. S. A.

FOXBORO PROCESS CONTROL CABINETS

FACTORIES IN THE UNITED STATES, CANADA, AND ENGLAND

REFINING
CASTABLE LININGS
for Regenerators
Engineering . . . materials . . . erection help! These are three ways Bigelow-Liptak can help refineries in the design of castable linings for regenerators and other petro-chemical furnaces. It all adds up to one-source efficiency —continuous on-stream service.
BIGELOW-LIPTAK Corporation
UNIT-SUSPENDED WALLS AND ARCHES
POWER
THIN WALLS
for
boiler enclosures
Boiler enclosures utilize Bigelow-Liptak unit-suspended thin walls in convection areas and behind water walls where low temperatures prevail. Where more severe conditions are encountered, thicker construction or tube-supported walls are recommended. Result: less down time . . . greater efficiency.
BIGELOW-LIPTAK Corporation
DRYER
93,000,000 BTU'S
Tougher than blazes . . . husky, yet streamlined . . . that's B-L's modern furnace for drying coal, sugar, salt, lumber and chemicals. The drawing above shows one which delivers 93,000,000 BTU's at a temperature of 1200° day after day —month after month—year after year!
BIGELOW-LIPTAK Corporation
UNIT-SUSPENDED WALLS AND ARCHES

TYPICAL B-L PRODUCTS FOR INDUSTRY

There are many, many applications for B-L furnace construction throughout industry. In steel mills, power houses, refineries and petro-chemical plants, sugar mills, coal mines, glass plants, city incinerators—anywhere in the heat of things—you'll find B-L installations. They're hanging up new records every day—providing top performance at a lower cost per BTU. You can get more information if you write—*today!*

BIGELOW-LIPTAK *Corporation*

and Bigelow-Liptak Export Corporation
2550 W. GRAND BLVD. • DETROIT 8, MICHIGAN

UNIT-SUSPENDED WALLS AND ARCHES

In Canada: Bigelow-Liptak of Canada, Ltd., *Toronto, Ontario*

ATLANTA • BOSTON • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND • DENVER • HOUSTON • KANSAS CITY, MO. • LOS ANGELES • MINNEAPOLIS • NEW YORK
PITTSBURGH • PORTLAND, ORE. • ST. LOUIS • ST. PAUL • SALT LAKE CITY • SAN FRANCISCO • SAULT STE. MARIE, MICH. • SEATTLE • TULSA • VANCOUVER, B.C.

first flight

Without trust in Daddy's strong arms, fear would blot out the fun of first flight. But because Daddy's smiling, loving face is below, life adds a thrilling new dimension, founded in love and trust.

All our adventures begin in and come home to the security we cannot do without.

To give and to get security is the main business of living. It is a privilege and a responsibility. It provides us life's finest rewards.

Have you ever thought that this security is possible only in a democracy? And that this is the source of America's greatest strength? For we continue to grow stronger as a nation when more and more secure homes are bulwarked together.

The security of your country depends on *your* security.

Saving for security is easy! Read every word—now!

If you've tried to save and failed, chances are it was because you didn't have a *plan*. Well, here's a savings system that really works—the Payroll Savings Plan for investing in U.S. Savings Bonds. This is all you do. Go to your company's pay office, choose the amount you want to save—a couple of dollars a payday, or as much as you wish. That money will be set aside for you before you even draw your pay. And automatically invested in Series "E" U.S. Savings Bonds which are turned over to you.

If you can save only $3.75 a week on the Plan, in 9 years and 8 months you will have $2,137.30.

United States Series "E" Savings Bonds earn interest at an average of 3% per year, compounded semiannually, when held to maturity! And they can go on earning interest for as long as 19 years and 8 months if you wish, giving you a return of 80% on your original investment!

Eight million working men and women are building their security with the Payroll Savings Plan. For your sake, and your family's, too, how about signing up today? If you are self-employed, ask your banker about the Bond-A-Month Plan.

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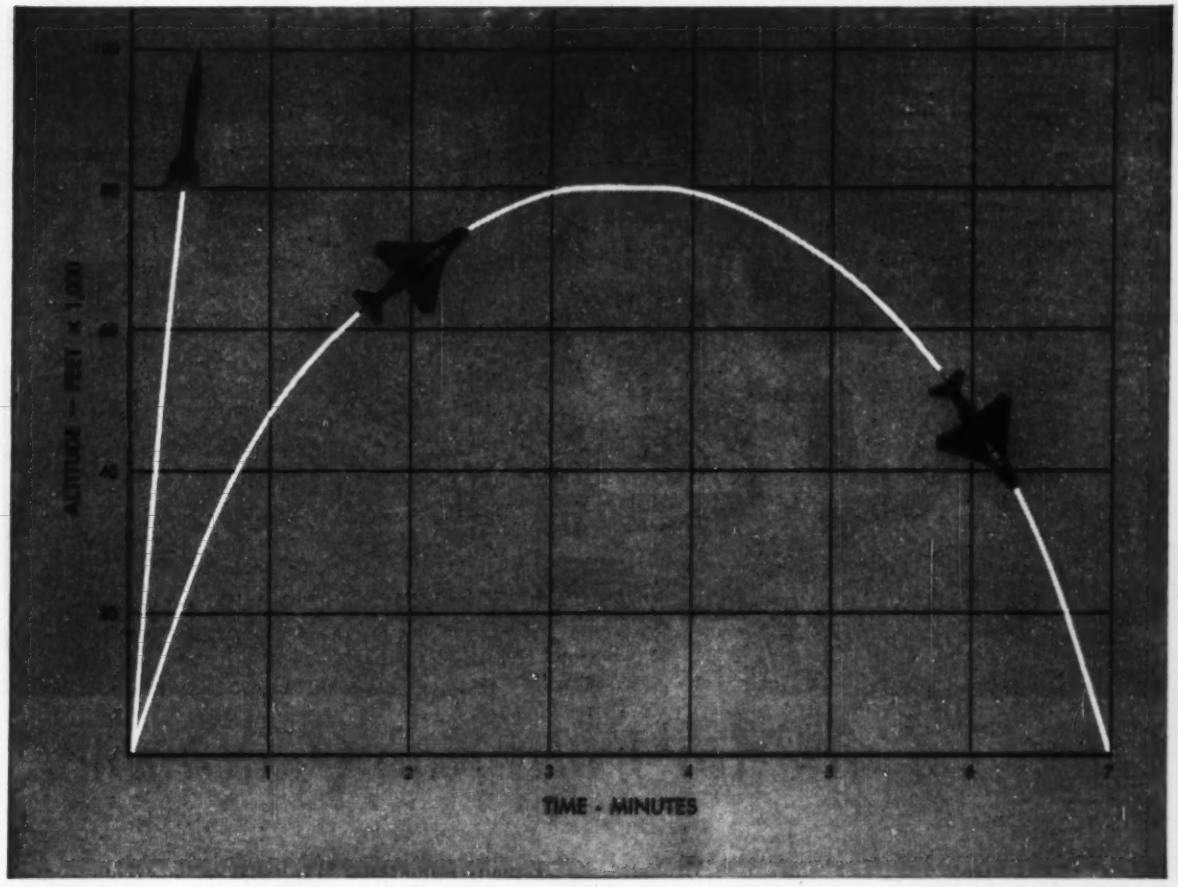


Sea Level to 80,000 Feet *in Three Minutes*

One of the many successful applications of Hagan Automatic Control is simulating flight conditions for testing jet engine components.

The automatic control system changes test chamber pressure (on a programmed basis), from sea level to 80,000 feet in three minutes. The program can be stopped at any altitude setting, for automatic control of a steady test chamber pressure.

For this installation, a programmed pneumatic signal dictates test chamber pressure to a regulator for conversion into a controlling signal to a hydraulic pilot valve. This, in turn, directs high pressure oil to a linear travel power unit for extremely fast and accurate operation of the controlling damper.

This Is Important

The same Hagan Automatic Control System is ready now for simulating flight to 80,000 feet in six seconds.

With the equivalent system utilizing Hagan electronic control elements, programmed trajectories from sea level to 100,000 feet in three seconds are obtainable.

HAGAN HALL BUROMIN CALGON

Hagan Corporation

AERONAUTICAL AND SPECIAL PRODUCTS DIVISION
HAGAN BUILDING, PITTSBURGH 30, PA.

Control Systems for Automotive and Aeronautical Testing Facilities
Ring Balance Flow and Pressure Instruments
Metallurgical Furnace Control Systems
Boiler Combustion Control Systems

"Here's a spot for Wolverine Qualitube*!"

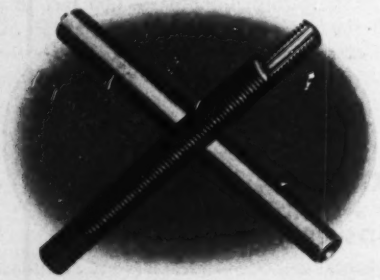
"Here's a spot where you can really shave costs, Mr. Jones. Wolverine's Qualitube—electric-welded steel tube—will handle your particular corrosion problem very nicely."

"But, Bob, I thought we had settled on Wolverine Trufin*. After all, we want to pack a lot of heat transfer surface in a small area."

"I mean Trufin! And I mean steel tube, too! We make Trufin in several metals . . . copper, copper-base alloys, aluminum, bi-metal, electric-welded and stainless steel. We've got exactly the right metal for your particular condition. Incidentally, another advantage of Qualitube is that you can use it at generally higher temperatures than most nonferrous tubing!"

"How about fabrication?"

"Trufin in any metal can be bent, coiled, or fabricated just like prime surface tube. That's one of the important points about Trufin in heat exchangers.



"Equally important, Mr. Jones, is the technical guidance available from our Field Engineering Service. These men know tubing and its application. Their special training is at the service of all Wolverine customers. Anytime you have a problem—just give us a call."

★ ★ ★

IF YOU'RE AT THE CROSSROADS:

Better switch over to Trufin. It's available in SAE analysis 1010. Literally jammed with helpful information is Wolverine's electric-welded steel tube catalog. Write for your copy—*today!* WOLVERINE TUBE DIVISION of Calumet & Hecla, Inc., 1483 Central Avenue, Detroit 9, Michigan.

Wolverine Trufin and the Wolverine Spun End Process available in Canada through the Unifin Tube Co., London, Ontario.

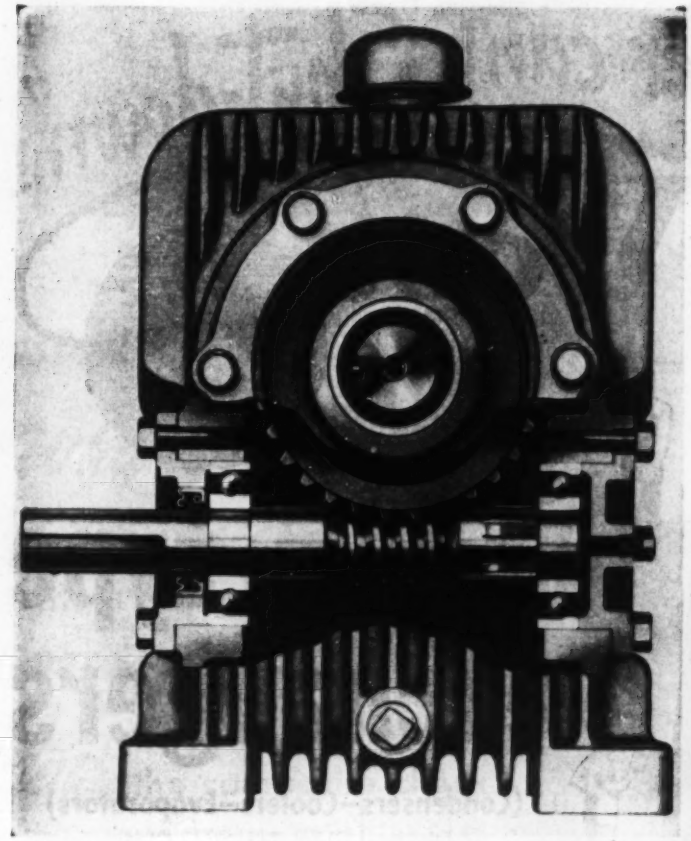
*REG. U. S. PAT. OFF.

EST 1916

WOLVERINE TUBE DIVISION
OF CALUMET & HECLA, INC.
Manufacturers of Quality-Controlled Tubing

PLANTS IN DETROIT, MICHIGAN, AND DECATUR, ALABAMA. SALES OFFICES IN PRINCIPAL CITIES

EXPORT DEPARTMENT: 13 EAST 40TH STREET, NEW YORK 16, NEW YORK.

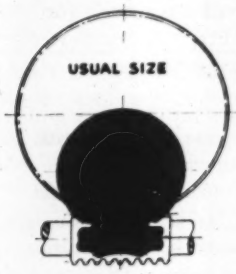


MORE HP PER POUND

MORE HP PER CUBIC INCH

MORE HP PER DOLLAR

You're looking at the "innards" of the most efficient worm geared speed reducer available today. It's Cone-Drive Gear's exclusive double-enveloping worm gear design, which means more load-carrying capacity, size for size, than any other type of right-angle speed reducer.



This simple design, with the gear and worm literally "wrapped" around each other, means a space and weight savings that often makes the difference between a compact, efficient product and just another machine.

You can specify (from stock) any one of 190,000 standard models of Cone-Drive gears to handle loads from fractional to 800 hp. You can have ratios from 5:1 to 4900:1. Fan-cooled or water-cooled models available if you should need them.

Interested? Get complete details in Bulletin 8901-50.

CONE-DRIVE GEARS

Division Michigan Tool Company

DOUBLE ENVELOPING GEAR SETS & SPEED REDUCERS

7171 E. McNichols Road • Detroit 12, Michigan

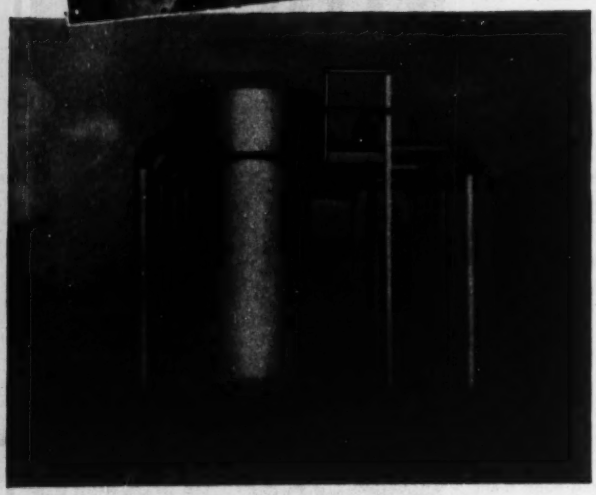
Dirty Water can't "Shut-down"...

Vogt

film type exchangers

(Condensers—Coolers—Evaporators)

Patent Nos. 1,935,270 - 2,057,597 - 2,424,441



River water, well water or brackish water are all alike to this exchanger *because it can be cleaned* while in operation! The water distributing ferrules need only be removed successively for the cleaning brush or tool whereby the tubes receive additional water which sluices away the dislodged dirt.

Vogt Film Type Exchangers are operating with real economy of first cost, operation and maintenance in power, petroleum, and chemical industries. They serve as Jacket Water Coolers, Feed Water Heaters, Hydrocarbon Evaporators, Sulphuric Acid Coolers, and Sulphur Dioxide Condensers, and can be designed to cool or heat any liquid and to condense or evaporate any fluid.

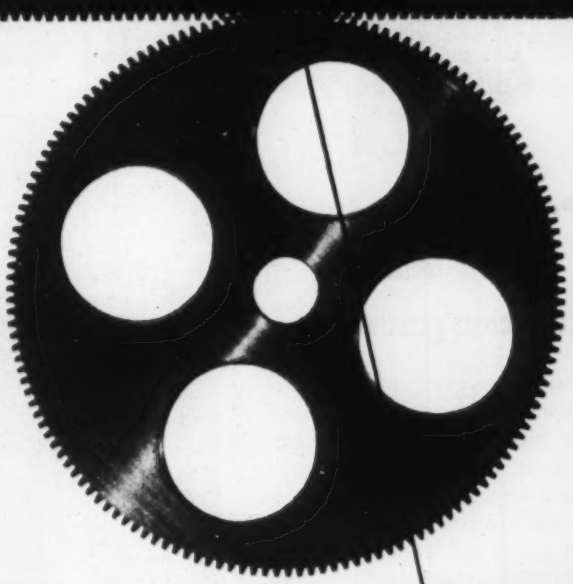
TOP: *Four units at Newton Falls, Ohio Municipal plant cool water for diesel engines and a lubricating oil cooler.*

BOTTOM: *Jacket Water Coolers serving engines of 7,300 HP in the compression plant of a Western Oil Refinery.*

[Bulletin HE-7 describes typical installations of Vogt Film Type exchangers and is available upon request.]

HENRY VOGT MACHINE CO., LOUISVILLE, KY.

Branch Offices: NEW YORK, CHICAGO, CLEVELAND, DALLAS, PHILADELPHIA, ST. LOUIS, CHARLESTON, W. VA.



Why you can *reduce rejection losses* with a Kodak Conju-Gage Gear Checker

Why the composite check

In practice, the final test of gear quality is how the gear works in use. The composite check recommended in American Standard B6.11-1951 shows this conclusively by measuring displacement of the gear when run against a master of known accuracy. And it does it in one quick operation that checks combinations of as many as six types of errors.

Why the Conju-Gage Gear Checker

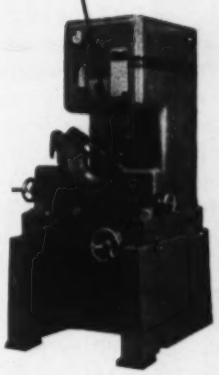
Since displacement represents the sum of both gear error and error in the master, the accuracy of the master used determines the precision of the composite check. The Kodak Conju-Gage Gear Checker uses a master of exceptional accuracy, the Conju-Gage Worm Section. Produced by thread grinding, its accuracy is not limited by the same manufacturing processes which limit accuracy in the gear itself.

To settle for masters of lesser accuracy is to rob yourself of "tenths"—to chance that tolerable error in a gear may coincide with error in the master to cause a needless rejection. Or that intolerable error in a gear may be cancelled by error in the master to pass a gear that will fail in use.

To reject every wrong gear is to guard the quality of your product. To pass every right gear is to reduce such rejection losses to a minimum.

To find out more about how a Kodak Conju-Gage Gear Checker can lower costs while maintaining required precision, send for your copy of the booklet, "Kodak Conju-Gage Gear Testing Principle." Write to

Special Products Sales Division
EASTMAN KODAK COMPANY, Rochester 4, N.Y.



The Kodak Conju-Gage Gear Checker automatically records the composite effects of runout, base pitch error, tooth thickness variations, profile error, lead error, and lateral runout. Illustrated is the Kodak Conju-Gage Gear Checker, Model 8U, for gears up to 8¼" pitch diameter. Smaller models are also available.

CONJU-GAGE INSTRUMENTATION

... a new way to check gear precision in action

To inspect all kinds of complex parts on a bright screen, Kodak also makes two highly versatile contour projectors.

Kodak

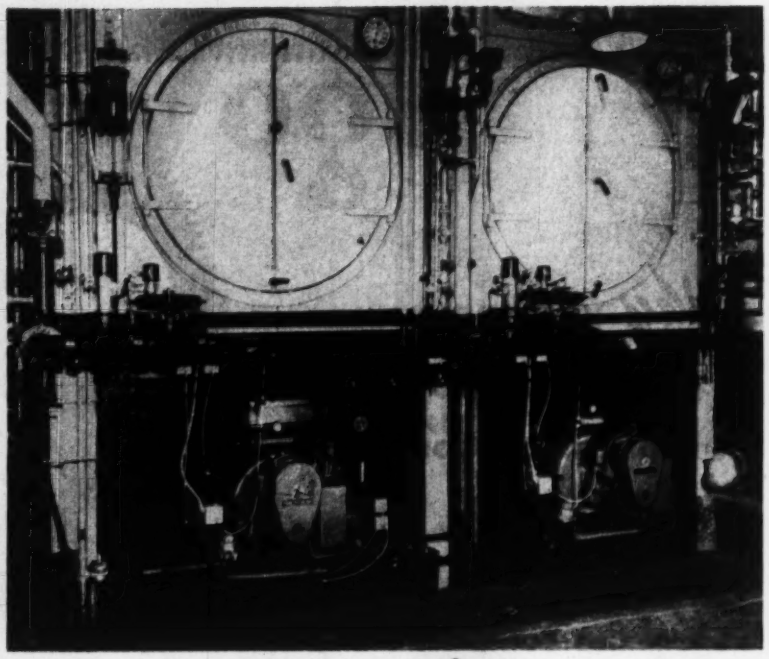
PHILIP MORRIS USES IRON FIREMAN

Protects manufacturing plants against fuel emergencies

In tobacco processing, steam is vital. When steam stops, the factories stop.

The big Philip Morris plants in Richmond, Virginia, are not dependent on a single fuel. Seven boilers in three steam plants can be fired with either gas or oil, and five of these boilers are also equipped for automatic coal firing. Iron Fireman equipment is used for firing all three fuels.

Boilers carry 135 psi steam pressure. Processing requirements impose severe demands on boilers and firing equipment. There are times when the boiler load is increased 200% in less than one minute. The response of the Iron Fireman burners is almost instantaneous, holding pressure variations to less than 3 psi. Under the former method of firing, steam pressure often fluctuated as much as 65 pounds—from 80 to 145 psi.—and safety valves would often relieve on sudden decrease of boiler load.



GAS-OIL

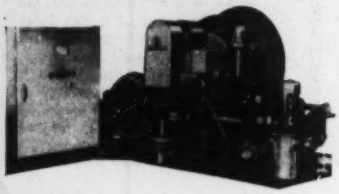
Two HRT boilers fired with Iron Fireman combination gas-oil burners. Fuel switch can take place at any time and requires only a few minutes. A third boiler in this plant is equipped for oil, gas or coal.

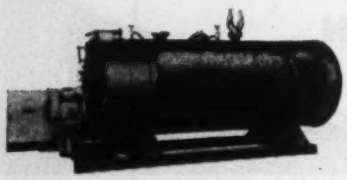
A three-fuel operation

Although heavy fuel oil is the basic fuel in these plants, the company finds it advantageous to use up to 1¼ million cu. ft. of gas each month to supplement oil firing. The switch from oil to gas and vice versa is accomplished in less than 10 minutes. For coal firing Iron Fireman Pneumatic Spreader stokers are used. Coal is automatically conveyed from main storage bunkers, and fired under automatic control.

Many other advantages in Iron Fireman firing

Much dryer steam is now available for processing, due to the steadier steam pressures maintained with the new equipment. Other improvements are these: 1. Lower refractory maintenance; 2. Lower maintenance on firing equipment (an average of less than $1.20 per month per unit since





PACKAGE UNIT FOR GAS, OIL AND GAS-OIL COMBINATION

This Iron Fireman package unit is much more than a conversion burner. It's a complete combustion system in which all elements are correctly balanced and integrated—a thoroughly engineered firing plant for all types of power and heating boilers. It includes burner (for oil or gas or both), fuel system, forced draft air supply, control panel, and pre-formed refractory combustion throat. Installation requires little more than bolting the entire unit to the boiler front and making service connections for power and fuel.

To the user this means a substantial saving in installation time and cost. But even more important, it means a factory tested and assembled unit. It is the most advanced and satisfactory method of modernizing a boiler plant.

Iron

for oil, gas, coal firing

MULTIPLE FUEL FIRING

IN THREE STEAM PLANTS

GAS-OIL-COAL

Boilers above and at right are equipped with Iron Fireman combination gas-oil burners. All of these boilers are also fitted for automatic coal firing, using Iron Fireman Pneumatic Spreader stokers feeding direct from bunkers.

installation; 3. Elimination of bulky coal handling equipment; 4. Cleaner boiler rooms and factory; 5. Labor saving.

Avoid costly shut-downs

Fuel emergencies, due to interruption or short supply, can be disastrous. Yet protection may cost little or nothing when offset by the fuel and labor savings of Iron Fireman multiple fuel firing. For full information on Iron Fireman firing equipment mail the coupon, or call your Iron Fireman dealer.

Fireman

for heating, processing, power

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Toronto, Ont.

Please send information on Iron Fireman multiple fuel firing. I am particularly interested in the following fuels:
☐ Oil ☐ Gas ☐ Coal

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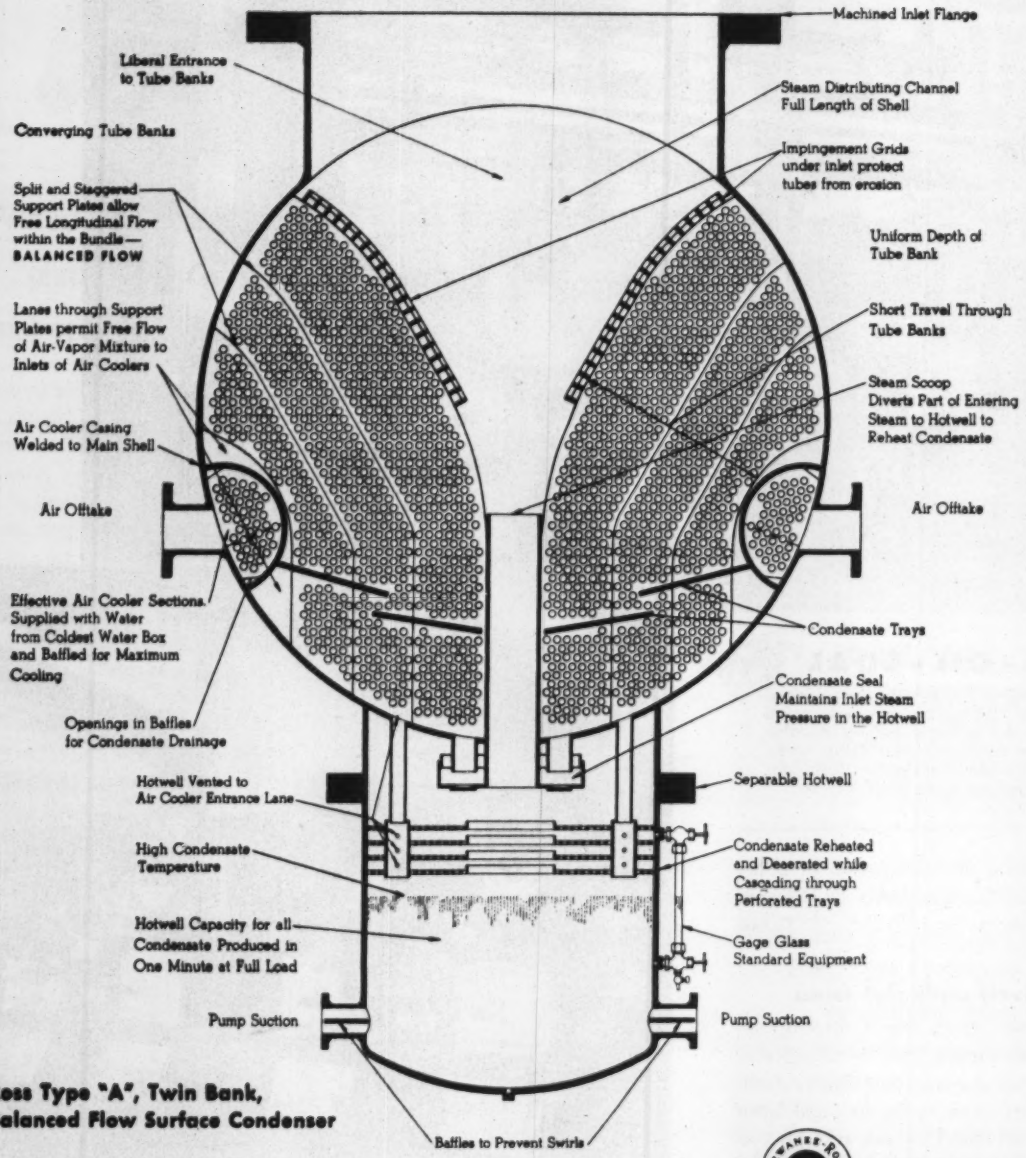
CITY and ZONE STATE

Design features that make Ross Surface Condensers A SOUND INVESTMENT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Liberal Entrance to Tube Banks
Steam Distributing Channel Full Length of Shell
Converging Tube Banks
Impingement Grids under inlet protect tubes from erosion
Split and Staggered Support Plates allow Free Longitudinal Flow within the Bundle— BALANCED FLOW
Uniform Depth of Tube Bank
Short Travel Through Tube Banks
Lanes through Support Plates permit Free Flow of Air-Vapor Mixture to Inlets of Air Coolers
Steam Scoop Diverts Part of Entering Steam to Hotwell to Reheat Condensate
Air Cooler Casing Welded to Main Shell
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Air Offtake
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Condensate Trays
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Condensate Reheated and Deaerated while Cascading through Perforated Trays
Hotwell Capacity for all Condensate Produced in One Minute at Full Load
Gage Glass Standard Equipment
Pump Suction
Pump Suction
Baffles to Prevent Swirls

Ross Type "A", Twin Bank, Balanced Flow Surface Condenser

The facts and figures on Ross Surface Condensers are impressive. It will be time well spent to have a Kewanee-Ross representative tell you *all* about the design features and distinct advantages of this truly modern line.

Long a leader in the field, the originator of such noteworthy developments as all-welded steel surface condenser construction, Kewanee-Ross is in a key position to meet your requirements *exactly* with standardized or special, large or moderate size, or packaged units.

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USEFUL LITERATURE

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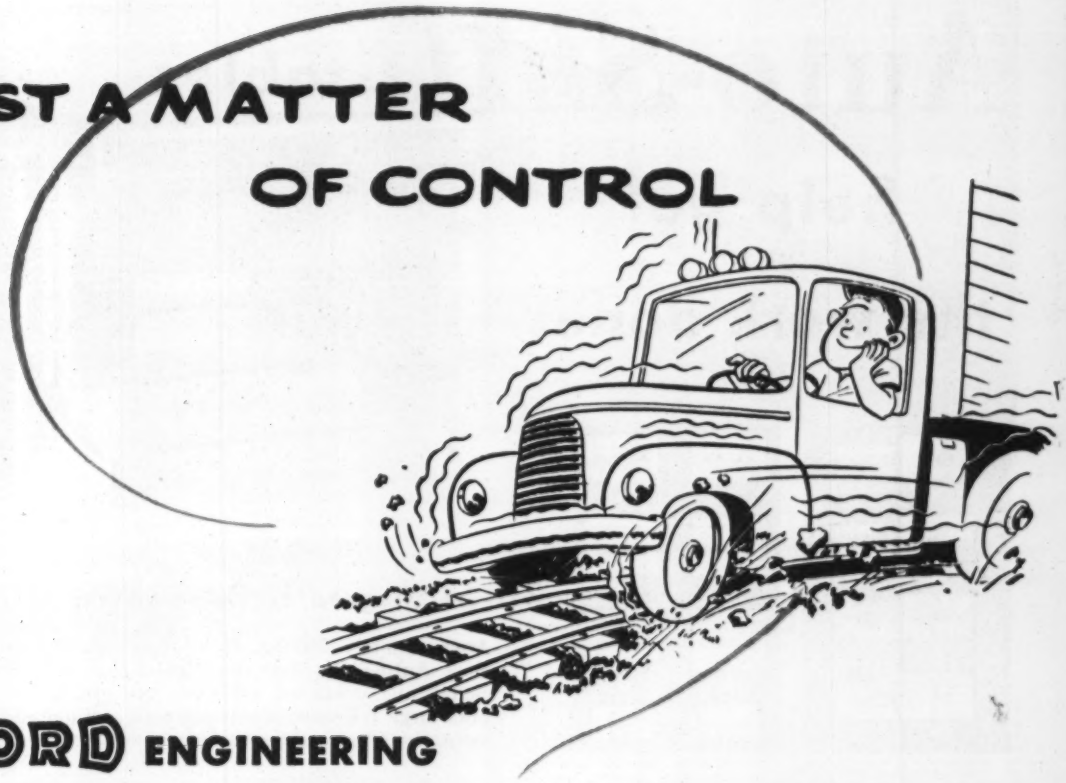

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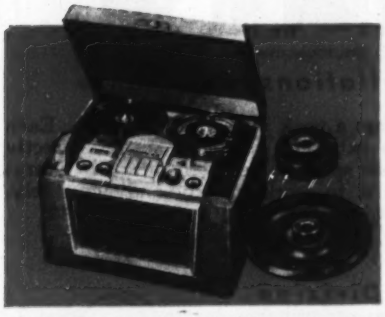

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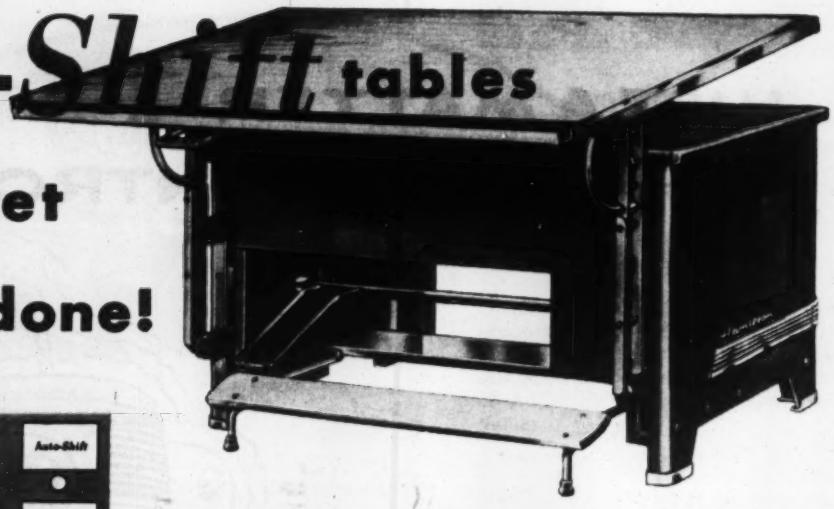

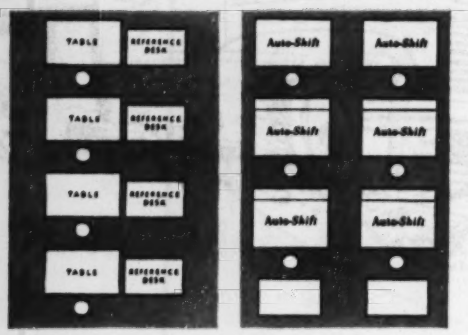

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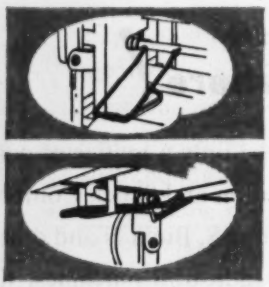

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Auto-*Shift* provides rapid, simple adjustment of both board height and slope—permits draftsmen to change working position frequently. Convenient foot release frees top for height adjustment—hand release permits rapid slope adjustment. Fully counterbalanced top moves effortlessly.

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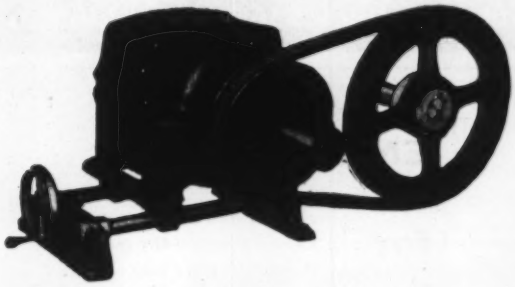
Hamilton Manufacturing Company

Two Rivers, Wisconsin

increase machine performance with

LOVEJOY Variable Speed PULLEYS



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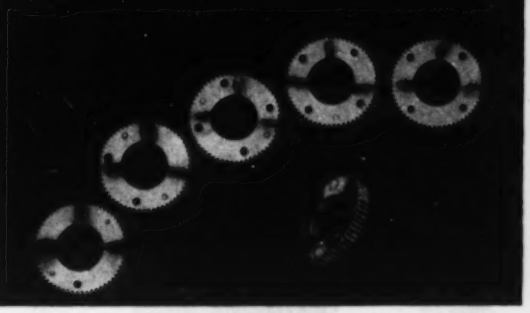

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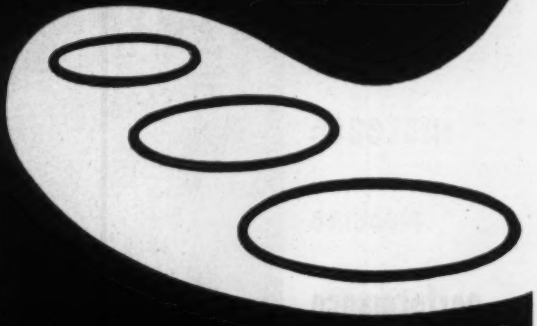

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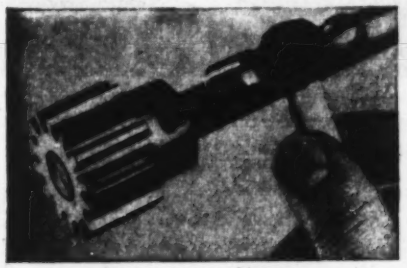
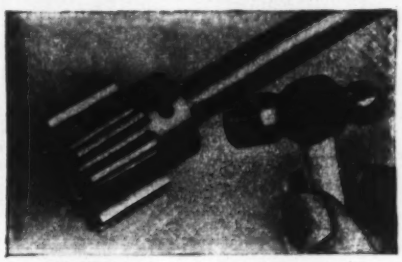


It compresses as driven.



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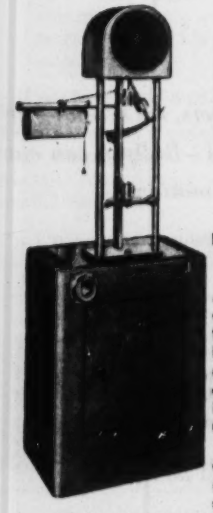

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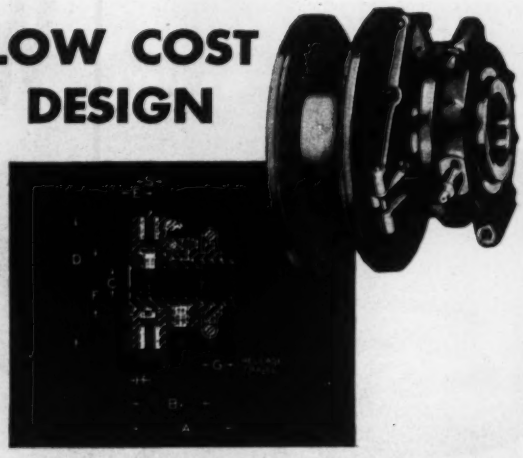

Before you approve the blueprint for your next model — double check to make sure it includes the latest improvements you can build into your product with the right type and size ROCKFORD CLUTCH. It will pay you to consult our engineers concerning technical clutch advances that will give you and your customers the advantages of better power transmission control.

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ROCKFORD CLUTCH DIVISION BORG-WARNER

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ROCKFORD CLUTCHES

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with NATIONAL ACME "FETTE" self-opening thread rolling heads

roll threads FASTER SMOOTHER STRONGER CHEAPER than any other tool

Precision is a must in the aircraft industry and the threading of studs is no exception. Here, thread specifications call for close tolerances and fine finish in materials that are tough to work with—stainless, high alloy and heat treated studs.

Rolled threads meet the requirements and National Acme "Fette" heads roll 'em at lower cost—save investment in second operation machines and often avoid rehandling because the heads can be applied to primary machining equipment.

These heads generate the thread ahead of the rolls insuring a flow of metal to full thread form without cratering at the crest—smoother, stronger threads with a burnished surface. And rolling speeds are the same as turning speeds with high speed tools.

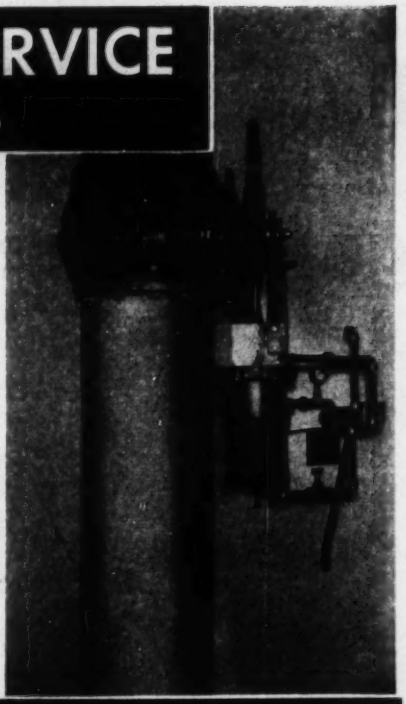
Bulletin FRH-53 shows specifications of the six head sizes --1/16 to 3/4" in non-revolving type head, 7/16 to 1" revolving type—or, ask your engineers to talk with ours.

The NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • Limit, Motor Starter and Control Station Switches • Solenoids • Contract Manufacturing

FOR HIGH VACUUM SERVICE
DeZURIK PLUG VALVES



The rubber-faced plug of a DeZurik Valve seals dead-tight in high vacuum . . . . . tighter than a metal-to-metal closure can possibly seal! The resilient rubber face of the plug is bonded to a metal core, preventing collapse or distortion of the plug at high vacuum, and insuring constant, dependable operation every time. DeZurik Valves are non-lubricated, opening or closing with an e-a-s-y quarter-turn. Exclusive eccentric action provides the tightest closure with least effort.

DeZurik Valves are manufactured in a full range of metals, in sizes from 1/2" to 20", in lever, gear or remote operated models with screwed, flanged or victaulic ends. Write for details and recommendations.

DeZURIK SHOWER CO.
SARTELL, MINNESOTA

Imperial

THE *Finest*

TRACING CLOTH

Imperial is known in drafting rooms all over the world as the traditional quality tracing cloth.

With the background of decades of experience, its makers have pioneered in modern improvements to maintain Imperial as the finest tracing cloth made.

Use a Classified Advertisement in
MECHANICAL ENGINEERING
for quick results

REPRESENTATIVES AVAILABLE REPRESENTATION WANTED
BUSINESS OPPORTUNITIES MANUFACTURING FACILITIES
EQUIPMENT FOR SALE *or* WANTED PATENT ATTORNEYS
HELP WANTED POSITIONS WANTED
EMPLOYMENT AGENCIES AND SERVICE BUREAUS

If you desire capital or have it to invest; if you have a patent for sale or development; if you have on hand used machinery for disposal, or if you want such equipment; if you have copies of publications, or a set of drawing instruments to dispose of; if you need help or want a position, in fact anything to be offered that somebody else may want, or anything wanted that somebody else may have—*use a classified advertisement in the Opportunities Section.*

RATES

Classified advertisements under this heading in MECHANICAL ENGINEERING are inserted at the rate of $1.70 a line, $1.35 a line to members of ASME. Seven words to the line average. A box number address counts as one line. Minimum insertion charge, 5 line basis. Display matter carried in single column units of multiples of one inch at the flat rate of $28 per inch per insertion. Copy must reach us not later than the 10th of the month preceding date of publication.

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
29 West 39th Street, New York 18, N. Y.

When some brick sell for as little as 10¢ each . . .

Why is this brick worth $1.70?

Suppose you put a muffle arch of these $1.70 brick in a furnace and — as a direct result — *doubled productive capacity*. Suppose you put them in the floor of another and it *lasted 50 times longer*. Suppose you put them in the hearth of a third and *eliminated 30 days downtime* in one year. Then at $1.70 apiece these brick would be a terrific buy. And are. Because these figures come from real, live companies! Companies that replaced ordinary refractories with CARBORUNDUM's super refractories!

Granted, you can't always get such spectacular results. But you usually get a combination of benefits. For example, by lasting longer, CARBORUNDUM's refractories automatically cut costly downtime losses . . . and maintenance expense . . . and labor. And by using heat more efficiently, you not only increase production . . . but cut fuel costs . . . and cut rejects. In short, their value is more — much more — than just to resist heat.

So if you could use a material that is far harder than metals . . . or one that conducts heat nearly as rapidly as chrome-nickel steel . . . or another that insulates well at temperatures above 3000 F — we have them. These "man-made minerals" range from a ceramic fiber (looks like cotton), to a superdense refractory that's cast, like a metal. And our engineers can show you how to combine these materials to exploit their complete range of properties.

WHY NOT CHECK UP? It's smart to at least know what super refractories *can do*. This coupon is your private introduction.

CARBORUNDUM

Registered Trade Mark

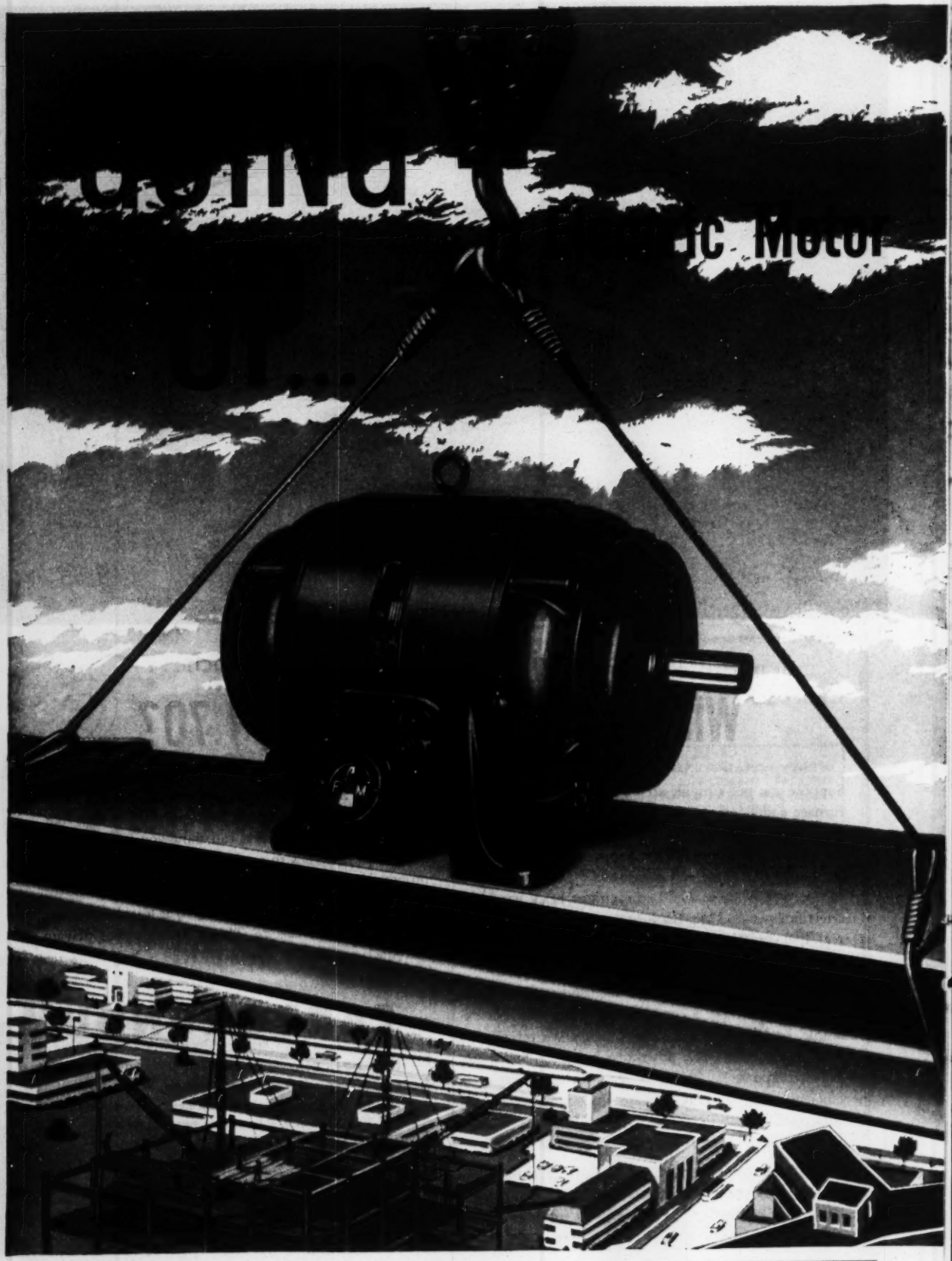
Dept. P-74, Refractories Division
The Carborundum Co., Perth Amboy, N. J.

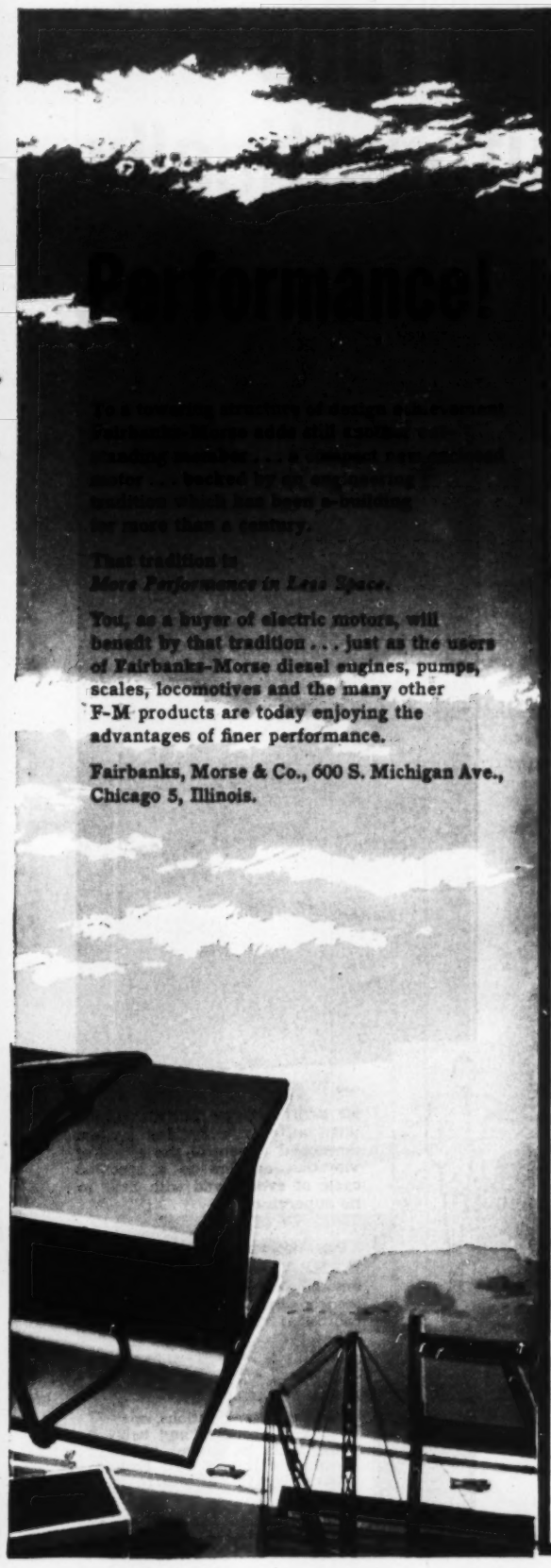
☐ Please send complimentary descriptive booklet.
☐ I'd like to talk with one of your engineers.

Name _____ Position _____

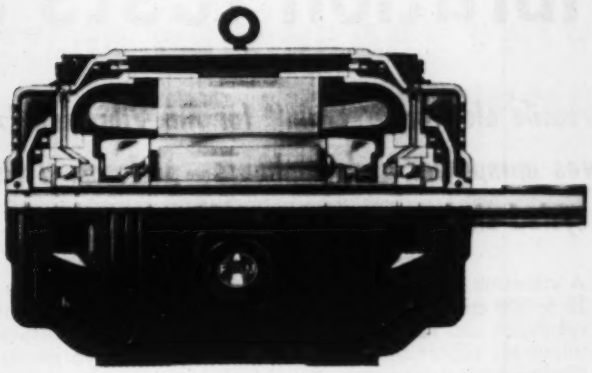
Company _____

Address _____




Performance!
More Performance in Less Space.
You, as a buyer of electric motors, will benefit by that tradition . . . just as the users of Fairbanks-Morse diesel engines, pumps, scales, locomotives and the many other F-M products are today enjoying the advantages of finer performance.
Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Illinois.

NEW FAIRBANKS-MORSE
TOTALLY ENCLOSED FAN-COOLED MOTORS



TOTALLY ENCLOSED—Wherever adverse operating conditions are encountered, F-M totally enclosed construction effectively insures electrical parts and bearings against contamination by dirt, abrasive dusts, metal particles, corrosive gases and steam.

DOUBLE-END VENTILATION—Cooling air is drawn through guarded openings in both fan shields and uniformly circulated through cored passages surrounding the sealed inner shell. Efficient heat-transfer action insures uniform internal cooling. Exhaust air is discharged through bottom of frame—not across motor and driven machine.

COPPERSPUN ROTOR—Exclusive Fairbanks-Morse feature—an indestructible one-piece rotor—homogeneous, free from flaws for maximum strength and lifetime service.

CONDUIT BOX—New, gasketed, cast iron conduit box permits easy pulling of cables without insulation damage. Fairbanks-Morse exclusive: recess feature allows elimination of conduit box where space is limited.

BEARINGS—Precision ball bearings are effectively sealed against grease leakage and contain ample lubrication for extended periods of rugged service. Convenient means are provided for flushing and relubricating if desired. Cartridge bearing construction is standard on all larger ratings.

FAIRBANKS-MORSE
a name worth remembering when you want the best

ELECTRIC MOTORS AND GENERATORS • DIESEL LOCOMOTIVES AND ENGINES • PUMPS • SCALES • RAIL CARS • HOME WATER SERVICE EQUIPMENT • FARM MACHINERY • MAGNETOS

MB cycling system runs vibration tests automatically

Versatile electronic "brain" for MB Vibration Exciters saves manpower and manhours—performs a variety of cycled shake-tests unattended!

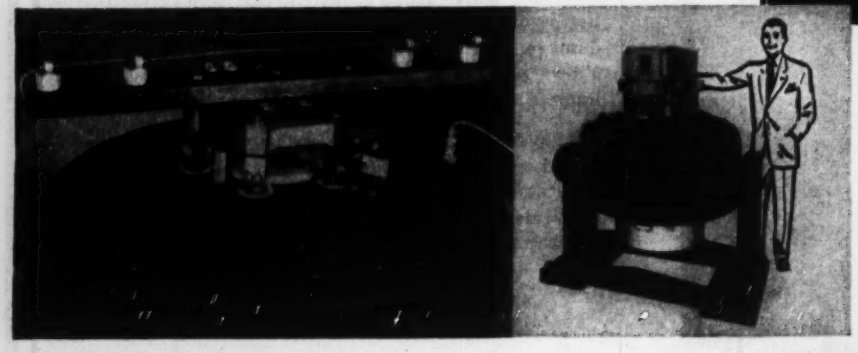
A vibration test that involves a continuous cycle of changes from 10 to 500 cps along with constant displacement or constant acceleration can now be done with great simplicity, accuracy and minimum supervision. Simply set up the specimen on an MB Shaker—set the controls for the desired actions—and let the cycling system take over.

This electronic unit varies shaker frequency at any sweep speed, and between any two preset frequency limits. It controls the exciter's amplitude or acceleration within ±10% for a dead mass or resonant type of loading and for cycled tests to satisfy MIL-E-5272 and other specifications.

For maximum flexibility of operation, this cycling system also provides for automatic transfer of constant amplitude to constant "g" at any preselected frequency setting.

The system can be operated manually when desired. It's also protected against control failure or conditions of extreme load resonances through use of an automatic structural strain control.

MB MODEL T-25 MC CONTROL CABINET with automatic cycling system developed to control the action of vibration exciters to a specified cycle of events, and with little or no supervision.



A VIBRATION TEST set up on the Model C-5 MB Vibration Exciter—and also one on Model C-25—two of the models which can be automatically controlled by MB's cycling systems.

SHAKE TESTING PAYS

Vibration testing tells how well a product will bear up in service, reveals design faults, determines fatigue strength.

Designed for heavy duty service, MB vibration exciters such as the Model C-5, rated at 750 pounds force, and the Model C-25 rated at 3500 pounds force, deliver maximum performance, pure table motion and dependable operation.

Send for detailed specifications on MB cycling systems. Also for Bulletin which gives data on vibration exciters.

THE MB MANUFACTURING COMPANY, INC.
1060 STATE STREET, NEW HAVEN 11, CONN.

BULLETIN TELLS MORE
Contains specifications, operating information and helpful hints on usages of the complete line of MB Exciters. Write for Bulletin 1-VE-4.

PRODUCTS AND EQUIPMENT TO CONTROL VIBRATION • TO MEASURE IT • TO GENERATE IT

Bendix-Westinghouse

OFFERS NEW BRAKE VALVE FOR LIGHT VEHICLES

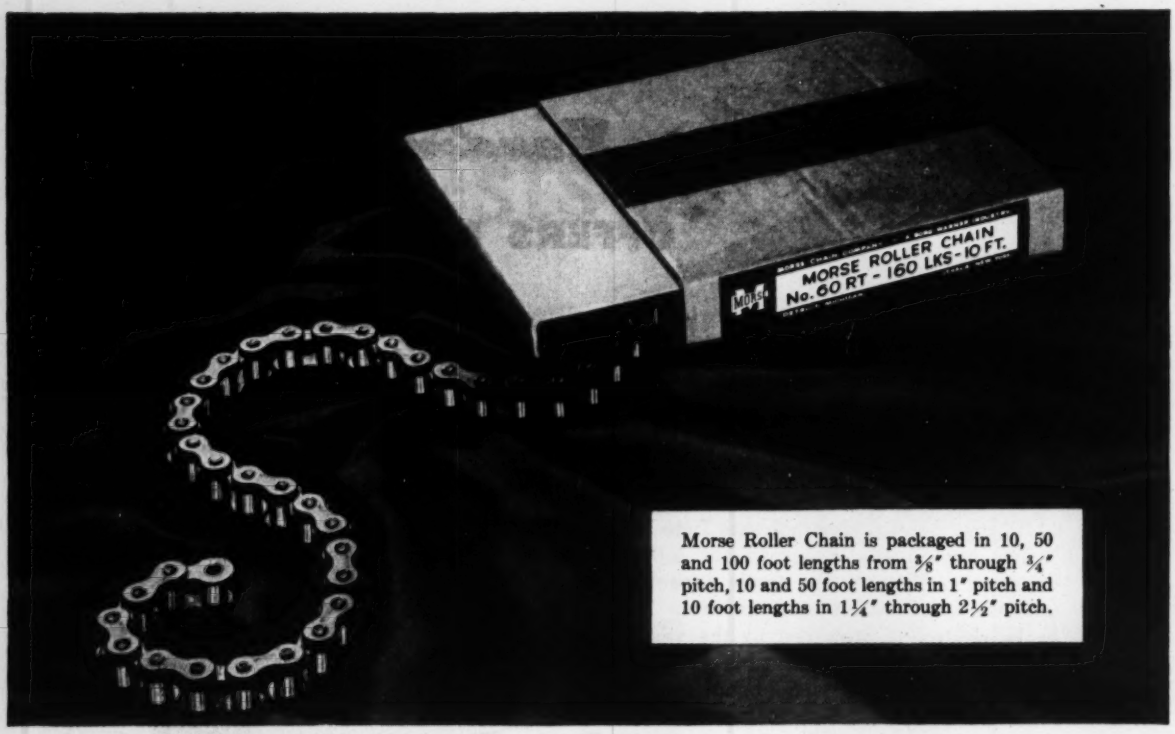
. . . The housing is a Parker Die Casting

THE new Bendix-Westinghouse Type "E" Brake Valve, specifically designed for light weight vehicle installations, has ample capacity to provide truly modern air brake control. Its treadle brake control is preferred by the vast majority of drivers. The valve housing is a Parker Die Casting. Original equipment manufacturers in nearly every industry have found that Parker Die Castings practically eliminate machining costs and materially reduce weight without loss of strength. You, too, may realize the benefits of die castings in your product. Consult with Parker today.

and when you think of Die Castings THINK OF

PARKER WHITE-METAL COMPANY • 2153 McKinley Ave., Erie, Pa.

PARKER ALUMINUM *and* ZINC *Die Castings*



Morse Roller Chain is packaged in 10, 50 and 100 foot lengths from ⅜" through ¾" pitch, 10 and 50 foot lengths in 1" pitch and 10 foot lengths in 1¼" through 2½" pitch.

End stockroom confusion this easy way!

Packaged Morse Roller Chain and Chain Parts end the time-consuming job of groping through bulk stocks in order to get the exact chain or part you need.

Morse packaging permits easier, neater storing and helps prevent accidental damage. The packaged roller chain and parts are clearly identified with labels indicating size and quantity, which noticeably reduce time spent taking inventory.

In addition to reducing handling problems and costs, Morse packaging maintains the fine precision of your roller chain and parts by guarding them from dirt, dust and corrosion. They stay clean until you are ready to use them.

Next time, order packaged Morse Roller Chain and Parts from your local Morse Distributor.

MORSE CHAIN COMPANY
7601 Central Avenue
DETROIT 10, MICHIGAN

Morse Taperlock Sprockets
Prompt delivery—no reboring, keyseating. Bushings permit close mountings. No flanges, collars, or protruding heads. Painted, boxed.

Morse Packaged Parts
Coupler, Connecting, Roller, Offset links are also boxed for quick identification, easy handling. Packaged in various quantities to suit your immediate needs.

MORSE
BW
MECHANICAL POWER TRANSMISSION PRODUCTS

FOR 24 REASONS, MASTERS OF MECHANICAL POWER TRANSMISSION SINCE 1893

Representatives—Sales Agencies
Business for Sale
Partnership—Capital
Manufacturing Facilities

OPPORTUNITIES

Positions Open—Positions Wanted—Equipment, Material, Patents, Books, Instruments, etc. Wanted and For Sale

Answers to box number advertisements should be addressed to given box number, care of "Mechanical Engineering," 29 West 39th St., New York 18, N. Y.

POSITIONS OPEN

RATES Classified Advertisements under this heading in MECHANICAL ENGINEERING are inserted at the rate of $1.70 a line. $1.35 a line to members of ASME. Seven words to the line average. A box number address counts as one line. Minimum insertion charge, 5 line basis. Display Advertisements carried in single column units of multiples of one inch at flat rate of $28 per inch per insertion. Copy must reach us not later than the 10th of the month preceding date of publication.

ENGINEERS PHYSICISTS

Our expanding staff assures permanent positions and excellent opportunities for personal and professional growth in

RESEARCH AND DEVELOPMENT

Weapon System Evaluation

Missile and War Head Development

Blast and Shock Wave Studies

Aerodynamics and Aeroballistics

Liberal benefits, including generous tuition refunds for graduate study. Send resumé to:

John F. Collins
ARMOUR RESEARCH FOUNDATION
Technology Center
Chicago 16, Illinois

Editorial Assistant

—of long-established technical magazine in the field of general mechanical engineering. Must be graduate of engineering school with practical engineering and editorial experience. Under 30 years of age, with ability to do original writing, rewriting, and abstracting, reporting and interviewing, and willing to travel. Location New York. Permanent position. Apply by letter with photograph, record of school and engineering work, references and salary expected.

Address CA-4596, % "Mechanical Engineering."

DEVELOPMENT AND PATENT LIAISON ENGINEER

Graduate engineer with imagination and familiarity with patent procedures. To review new designs for novelty; supervise disclosure and record keeping of new ideas; serve as liaison between Company and its Patent Counsel. Opportunity also for personal participation in product development and research. Principal products are shock and vibration isolators of great variety.

Box 369, Erie, Pennsylvania

MECHANICAL ENGINEER NEEDED FOR EXPLORATORY RESEARCH and NEW DEVELOPMENTS

Prefer man with research experience in mechanisms or structures and who likes to do some experimental work to prove his theoretical conclusions.

BORG-WARNER CENTRAL RESEARCH LABORATORY
BORG-WARNER CORPORATION
Bellwood, Illinois

THEORETICAL MECHANICAL ENGINEER

Progressive well established pulp and paper manufacturing concern has opportunity for a mechanical engineer to work with 100 man research organization in performing theoretical investigation and mechanical design.

While reporting to Director of Research and Development, will work on problems for any of several research sections. Advanced training or experience and ability to work independently required.

Pleasant midwest town of 22,000. One hour drive from Columbus, Ohio. Inquiries held confidential.

Contact
R. L. WARNER
THE MEAD CORPORATION
CHILLICOTHE, OHIO

SENIOR EQUIPMENT ENGINEER

Permanent position now available in an East Coast engineering and construction organization with an international reputation in the oil and chemical industries.

The job requirements include a degree in mechanical, chemical or electrical engineering, and 8 years' experience in the chemical or petroleum industries. 5 of these years must have been in mechanical equipment. Also desired is advanced technical knowledge in design and development of centrifugal and reciprocating machines, and packed units used in the industry and in power plant auxiliaries.

The man selected will be required to perform analyses of equipment selection and application problems; to solve complex problems in dynamic vibration and corrosion in petroleum and chemical service; and to consult on development of special equipment.

The salary is high and their is an unusually liberal employee benefit program including executive insurance and a retirement plan. Traveling and moving expenses will be paid.

Please submit complete details of background and experience and include initial salary requirements.

BOX #392, ROOM 1201, 230 WEST 41ST ST., NEW YORK 36, N. Y.

Three Pages of "OPPORTUNITIES" This Month . . . 101-103

MECHANICAL ENGINEERS

Caltech, Jet Propulsion Laboratory, is now offering select positions requiring a considerable degree of initiative, creative ability and responsibility.

Experienced Mechanical Engineers are needed for design and development of small auxiliary power supplies. Experience with air turbines, reciprocating gasoline engines, gas turbines or electric alternators is desirable.

Send your resumé today to

JET PROPULSION LABORATORY
California Institute of Technology
4800 Oak Grove Drive
Pasadena 3, California

EXPERIENCED ENGINEERS WANTED,

Air Products, Incorporated has openings for outstanding, capable engineers with 3-8 years of experience in each of its Process, Estimating, Project and Development Departments. Good scholastic record and good personality essential. The Process, Project and Development positions require experience in or related to those positions. Experience in design and fabrication of complex liquid containers especially valuable in the Project Engineer opening. The estimating position to be filled by an experienced estimator who enjoys that work and has made contributions in that position. Starting salary commensurate with experience. Excellent opportunity for advancement in this fast-growing medium-size chemical-equipment engineering and manufacturing Company.

Reply to: **Air Products, Inc.**
Personnel Department
P. O. Box 538
Allentown, Pennsylvania

RESEARCH ENGINEERS

Senior level research engineering positions are now available in our Research Laboratory. The work involves development and evaluation testing of electro-mechanical aircraft components. Three to eight years' experience in aircraft design or laboratory test work desired in addition to Mechanical or Electrical Engineering Degree.

Write Section
Engineering Personnel Office

NORTH AMERICAN AVIATION, INC.
5601 W. Imperial Hwy.
International Airport
Los Angeles 45, Calif.

Additional Opportunities are offered in the display advertisements— on pages

44, 54, 59, 69, 89, 90

ENGINEERS

GRADUATE MECHANICAL OR ELECTRICAL

Design and develop printing telegraph and related communication equipment.

MECHANICAL

To analyze customer needs, review existing techniques, establish design approach for new products, and develop sound designs for manufacture.

ELECTRICAL

To develop switching, storage and similar circuitry. Should be trained in communications and electronic circuits and possess broad interest in Mechanical as well as Electrical Engineering.

Address Communications to:

TELETYPE CORPORATION
2600 N. Southport
Chicago 14, Illinois

Attention: Employment Department

ENGINEER FOR RESEARCH AND DEVELOPMENT

A well-qualified graduate engineer is required for our plant engineering group.

The functions of this engineering group include the mechanical design and specifications, all necessary fabrication and construction drawings and detail, and field work involved in the construction of pilot plants and general plant installations.

Special consideration will be given applicants having experience in electrical installation and design and in instrumentation with an appreciation and understanding of mechanical engineering.

Applications including a complete resumé of background and experience and technical references may be mailed to:

C. G. Smith, Business Manager
Celanese Corporation of America
P. O. Box 8, Clarkwood, Texas

mechanical engineers

General Electric Offers Opportunities In The Design and Development of Electronic Products

Continuing expansion of General Electric's Electronics Division has created new openings for qualified Mechanical Engineers. These assignments—available immediately—are for design and development work on electronic product lines which include:

Television and Radio Receivers
Automatic Machines
Military Radio and Radar Equipment
Cathode-Ray Tubes
Components for Electronic Equipment

This is stimulating and challenging work, involving a wide range of interesting engineering problems in such varied fields as:

servo-mechanical and remote control • printed circuits • heat transfer • mechanization of process or assembly • shock and vibration • machine design • product design • antenna structure

For these career positions, the minimum requirement is a B.S. in Mechanical Engineering, or the equivalent in experience. Engineers with degrees in other fields, who have a strong interest in mechanical design problems, may also qualify.

A General Electric career offers many advantages to ambitious and creative engineers:

permanent employment with a leading company . . . steady advancement . . . finest facilities and equipment . . . diversified pioneering projects . . . association with leading engineers . . .

PLUS

pensions . . . life insurance . . . paid vacations . . . surgical and hospitalization benefits . . . educational subsidies . . . and others.

Write: Technical Personnel

GENERAL ELECTRIC

P.O. BOX 1122 SYRACUSE, N. Y.

It will pay you to read the announcements on these pages for an opportunity that you may be looking for or one that may be of interest to you.

Three Pages of "OPPORTUNITIES" This Month . . . 101-103

ENGINEERING PHYSICIST

or

MECHANICAL ENGINEER

Leading chemicals and plastics manufacturing company, Delaware Valley area, seeks B.S. or M.S. Engineering Physicist or Mechanical Engineer for Physics Research Laboratory. Stimulating program in development of methods for evaluation of physical properties of materials, primarily plastics. Assistant to Senior Head of large group. Write full details of experience and training in this field, general background, salary expected, for confidential handling to

X-70, P. O. Box 3495
Phila. 22, Pa.

AAA-1 Manufacturer of bearings requires SALES ENGINEER to locate near Washington, D. C., and cover certain areas to the south and north of Washington. Mechanical engineering degree preferred; considerable traveling necessary. Company furnishes car. Address CA-4720, care of "Mechanical Engineering."

SALES ENGINEER—Established West Coast Turbine Pump Company expanding operations eastward. Seeking experienced industrial pump sales engineer, preferably located in East to build dealer organization east of Mississippi. Reply giving age, experience and expected compensation. Address CA-4725, care of "Mechanical Engineering."

INSTRUCTOR of ENGINEERING DRAWING and DESCRIPTIVE GEOMETRY. Salary up to $4700 for 9-month period and assistant professorship for qualified person. M.E. graduate preferred. Dept. of Engr. Drawing, University of North Dakota, Grand Forks, North Dakota.

ACTING HEAD MECHANICAL ENGINEERING DEPARTMENT—For a two-year period, beginning September. Continuing employment in department after two-year period as head. Salary $6000-$7000 for eleven months' service, depending on qualifications. Man with maturity and usual academic and experience qualifications desired. Address applications with complete data to Dean of Engineering, Colorado A & M College, Fort Collins, Colorado.

STAFF ENGINEER—Servicing Corrugated Box Plant on Quality Control, Standards, Safety, Maintenance and mechanical improvement projects. Require engineering graduate 25-30 years' old, with general engineering experience. Address CA-4738, care of "Mechanical Engineering."

INSTRUCTOR—in mechanics and machine design for expanding department, excellent potential, begin Sept. 15, M.S. required. Opportunity for suppl. income evenings and summers, teaching or in local industry. Write Director, Div. of Engr., Univ. of Bridgeport, Bridgeport 4, Conn.

ENGINEERS (Career Opportunity)—Important Aircraft Engine Accessory Manufacturing Company in Central Connecticut, has openings for graduate engineers in their Project Engineering Department. 1. Require men to set-up and perform system analysis by use of analogue computer equipment. With background of servo theory for dynamic analysis of feedback control systems, as applied to turbojet and turboprop engines. 2. Men with background in fluid mechanics to work on hydraulic control development and fuel systems for turbojet engines. Required to execute design and performance analysis for steady state and transient conditions. Also have several interesting openings for recent Mechanical and Electrical Engineering graduates. Ideal suburban location for working and living. Send resumé of education, experience and salary requirements. Address CA-4741, care of "Mechanical Engineering."

HEAT TRANSFER—Graduate Engineer with experience in rating Tubular Heat Transfer equipment for Oil Refining and Chemical Processing plants. Some process experience would be desirable but not necessary. Submit resumé in first letter. Downingtown Iron Works, Inc., Downingtown, Pennsylvania.

POSITIONS WANTED

PLANT ENGINEER—Mechanical—Age 36. 14 years' in Drug, Chemical, Machinery and Construction Fields. Experience in design, application, liaison and maintenance functions. Presently responsible for operation and maintenance of utilities and facilities, and maintenance of production equipment. Location and salary open. Address CA-4711, care of "Mechanical Engineering."

MECHANICAL ENGINEER—Member ASME, 35, 12 years' experience in ordnance, R & D and laboratory instrument design. Presently employed as administrative-liaison engineer. Desires administrative position in research and development organization. Address CA-4722, care of "Mechanical Engineering."

SALES ENGINEER—BSME over 20 years' experience in product design, manufacturing, cost estimating and sales engineering. Desires position sales engineer or manufacturers agent. Complete personal data furnished on receipt of description of product, potential, sales policy etc. Replies held strictly confidential. Address CA-4723, care of "Mechanical Engineering."

PROJECT ENGINEER—40, married, BSME, Registered. Refinery and Chemical Plant experience. Supervision, estimating and diversified design. Heavy on piping and pressure vessels, especially for pressures at 10,000 PSI. Desires position of increased responsibility. Address CA-4724, care of "Mechanical Engineering."

PRIME YOUNG EXECUTIVE—talent with strong background research and development, with broad interests. Works best under burden. Seeks position leading to advanced technical management responsibilities. Age 37, BSME, holds patent, presently Project Engr aircraft accessories. Prefer northern clime. Address CA-4730, care of "Mechanical Engineering."

POWER PLANT ENGINEER—M.E.—20 years' broad power and mechanical experience—power, chemical, process plants—supervision, design, construction, maintenance, operation. Prefer varied engineering or supervision—small industrial plant with power plant. Address CA-4733, care of "Mechanical Engineering."

EXECUTIVE ENGINEER—20 years' experience in supervision, maintenance, plant engineering, construction, budgetary control and supervisory training in large chemical plants and heavy machine industries. B.S. in M.E., M.S. in Ch.E., Professional Engineer (N.Y.). Desires position on management level in chemical or allied industry. Address CA-4744, care of "Mechanical Engineering."

Use a
CLASSIFIED
ADVERTISEMENT
for Quick Results

EXECUTIVE ENGINEER AVAILABLE—Mechanical-Electrical Engineer, Professional Engineer in New York State, good organizer, coordinator and administrator. Capable of taking full charge and coordinating design, development, procurement, production and sales. Over twenty-three years' successful experience in maintenance, sales, design, development and manufacture of tools, dies, centrifugal pumps, production machines, coaters, driers, calenders, gears, hydraulic equipment, handling equipment, metal fabrications, coated fabrics, steam and hydro-electric power generation. Desires position as Manager, Chief Engineer, Executive Sales Engineer or Consulting Engineer with progressive organization where hard work, sound judgment and results will be properly rewarded. Address CA-4745, care of "Mechanical Engineering."

EMPLOYMENT AGENCIES AND SERVICE BUREAUS

ENGINEERS AND EXECUTIVES—This confidential service for outstanding men who desire positions paying $5,000 to $40,000 will develop preliminary negotiations with reputable organizations without risk to present position. For complete details, send experience record and expected salary range. Tomsett Associates, 337 Frick Bldg., Pittsburgh 19, Pa.

EXECUTIVES, ENGINEERS, DESIGNERS, SPECIALISTS. Our staff—technical graduates—serving both employer and applicant 20 years'—no fee until placed—Bradley Placement Service, 555 Leader Building—Cleveland 14, Ohio.

SALARIED PERSONNEL $3,000—$25,000

This confidential service, established 1927, is geared to needs of high grade men who seek a change of connection under conditions, assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited.

JIRA THAYER JENNINGS
Dept. J. 241 Orange Street, New Haven, Conn.

SALARIED POSITIONS $5,000 to $35,000. We offer the original personal employment service (established 44 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered, present position protected. Ask for particulars.

R. W. BIXBY INC.
602 Brisbane Bldg. Buffalo 3, N. Y.

EQUIPMENT FOR SALE

WORL TIME CLOCK—Twenty-four time zones on one face of a clock made of transparent plastic. Pat. No. 159249. J. C. Owinski, Glen Lake, Minn.

REPRESENTATION WANTED

MANUFACTURERS REPRESENTATIVES—to represent large Mid-Western manufacturer of speed reducing transmissions and cut gears of all types, on a commission basis, for area around Los Angeles, California. Must be experienced in engineering and sales. All replies strictly confidential. Address CA-4700, care of "Mechanical Engineering."

Every Advertiser appearing in MECHANICAL ENGINEERING believes . . . . that his products . . . the service in them and the service behind them . . . will stand up under the most searching scrutiny of the high calibre engineers and executives comprising MECHANICAL ENGINEERING readership.

RATES One inch Card Announcements inserted at a rate of $20.00 each issue, $15.00 per issue on yearly contract.

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Manufacturers of Equipment Not Included

BLACK & VEATCH
CONSULTING ENGINEERS
Electricity—Water—Sewage—Industry
Reports, Design, Supervision of Construction
Investigations, Valuation and Rates
4706 Broadway — Kansas City 2, Missouri

GEORGE H. KENDALL
Consulting Mechanical Engineers
Methods Studies: Process of Product
Redesign Existing Products for Greater Profit
Trouble Shooting Production, Design, Cost Problems.
Specialist Automatic Machinery Processes, Controls,
New Developments, Patent Studies, Investigations,
New Products & Process Engineering Studies.
P. O. Box 3 (*Est. 1923*) Tel. Darien 5-1504
Noroton Heights — 3 Offices — Darien, Connecticut

PROPANE GAS PLANTS
and
Anhydrous Ammonia Plants
PEACOCK CORPORATION
Box 268, Westfield, N. J. Westfield 2-6258

DIGIMATHIC CO.
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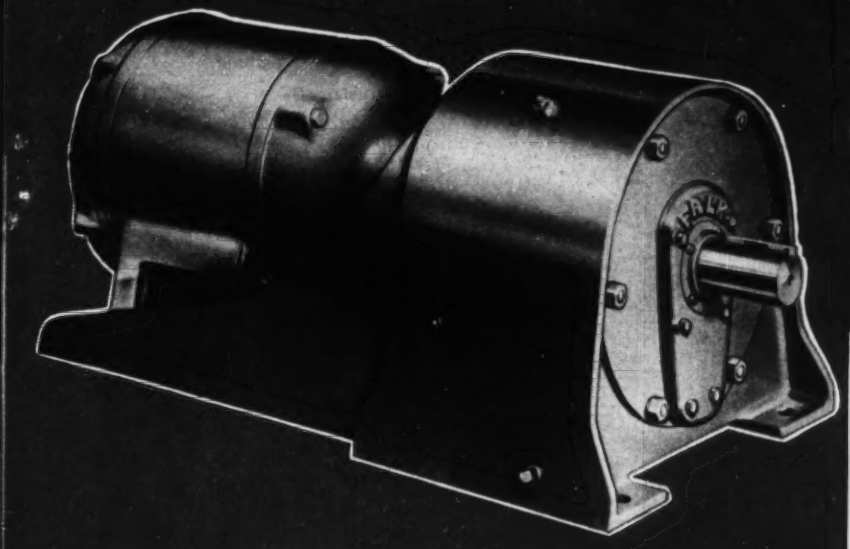

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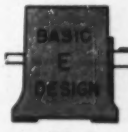

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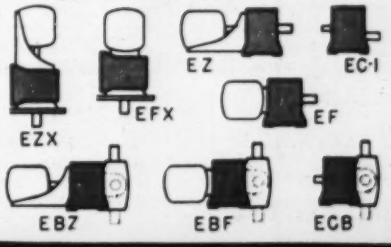

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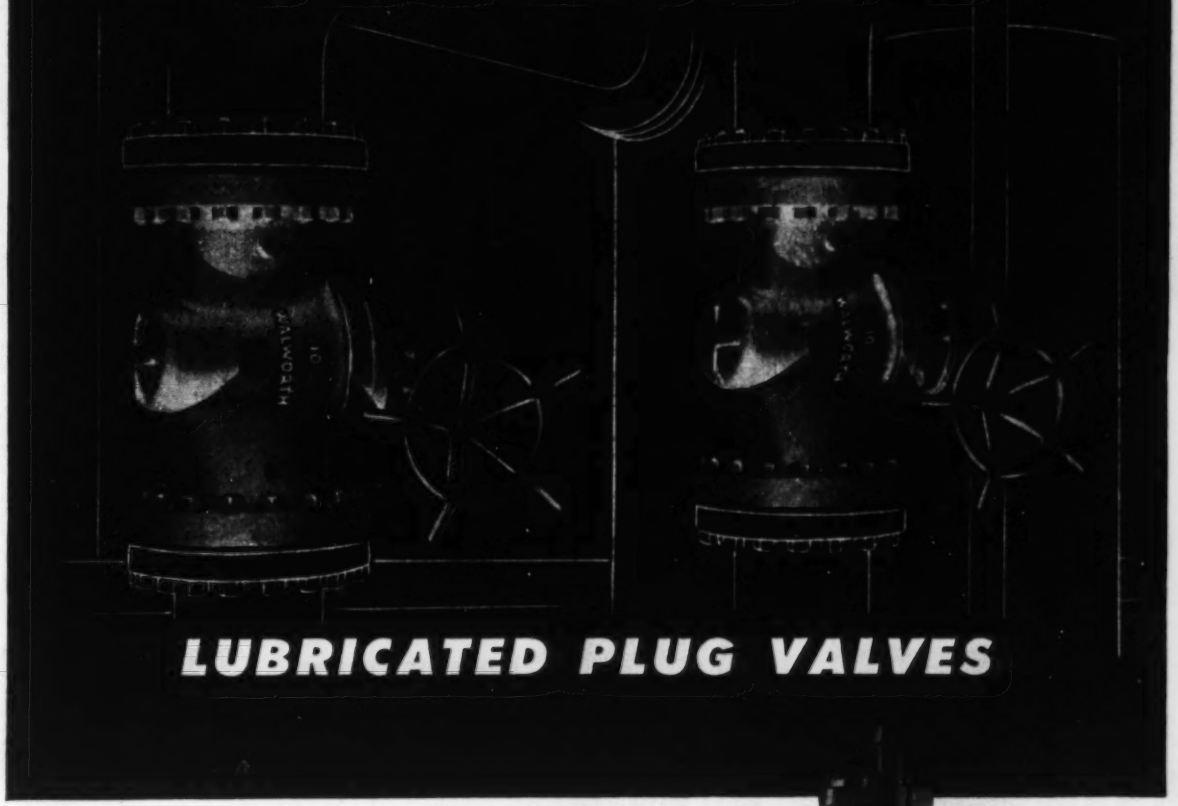

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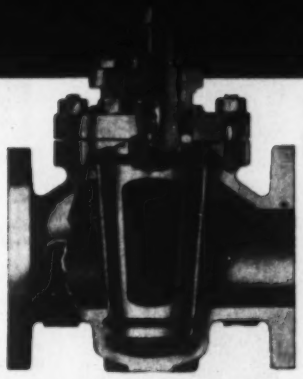

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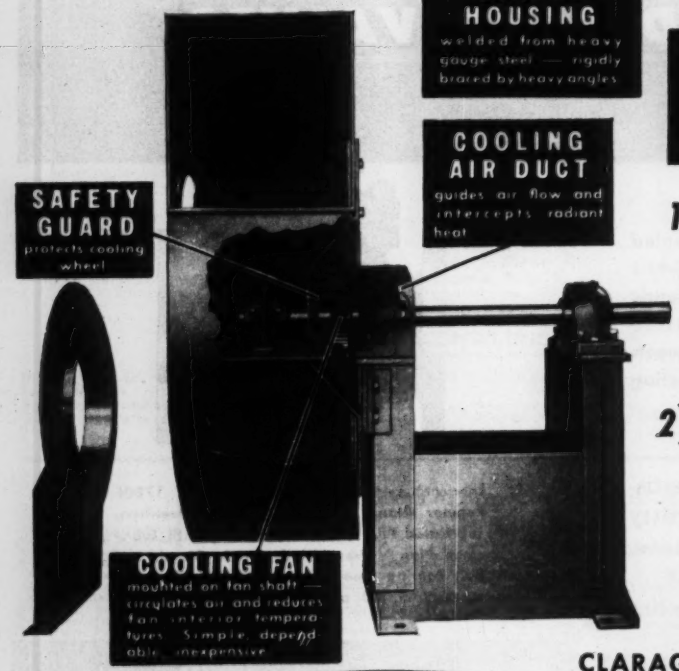
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COOLING FAN
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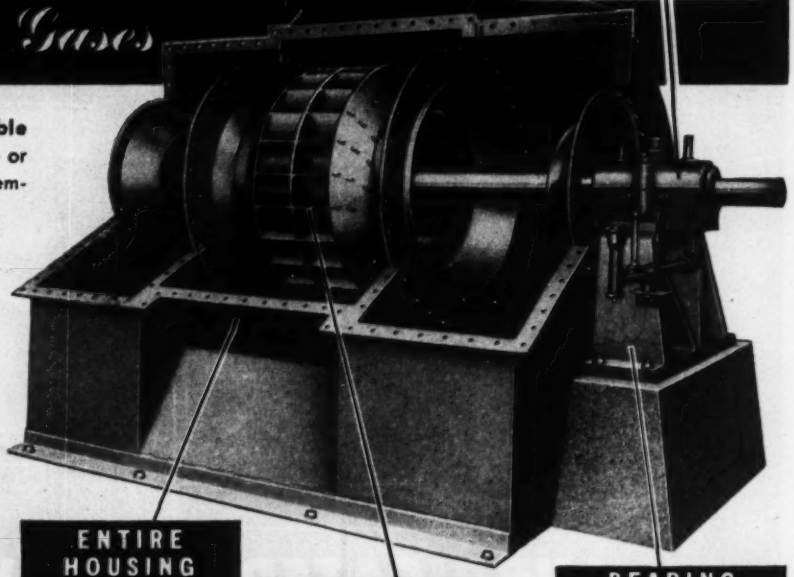
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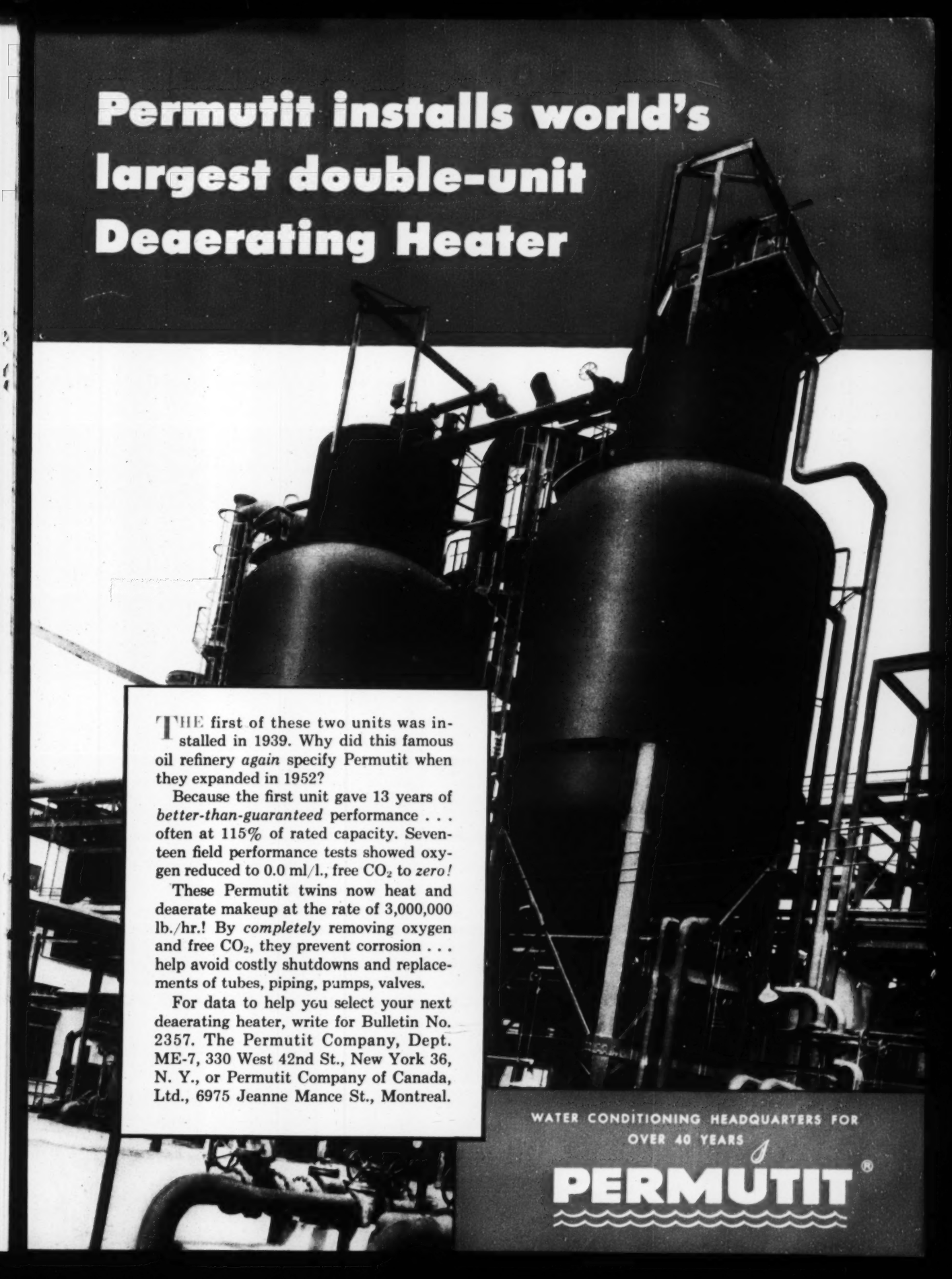

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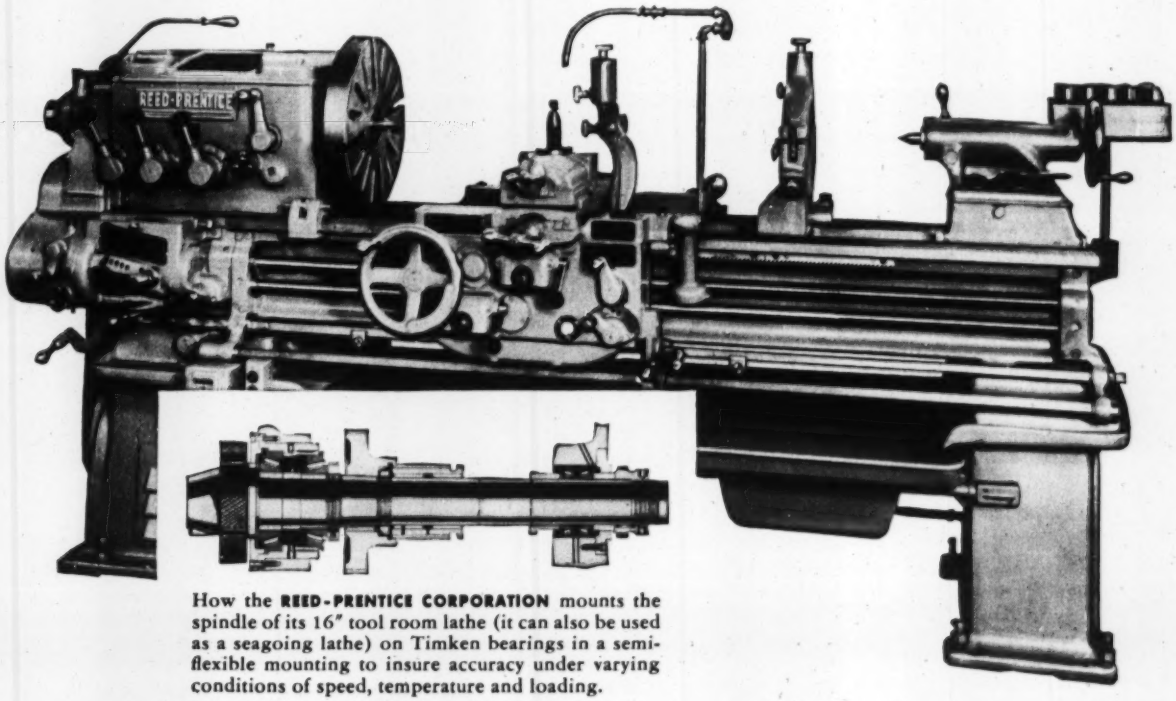
In this semi-flexible mounting, the innermost of the two front spindle bearings is mounted in a cup carrier. One end of the carrier has a slight radial clearance in the housing while the other end has a tight fit. The clearance between carrier and housing permits radial expansion without excessive preloading of the bearing. As a result, from the beginning to the end of every job, uniformly high spindle precision is maintained.

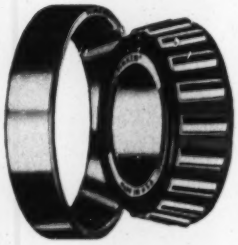
Timken precision bearings are especially designed for spindle applications. Their tapered construction lets them take radial and thrust loads in any combination, holds spindle rigid, permits pre-loading to any desired degree to prevent chatter.

Next time you buy or build a machine tool, make sure it's Timken bearing equipped. Timken bearings practically eliminate friction, give longer life with less maintenance. Always look for the trademark "Timken" stamped on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ont. Cable address: "TIMROSCO".

TIMKEN BEARING EQUIPPED *This symbol on a product means its bearings are the best.*



How the **REED-PRENTICE CORPORATION** mounts the spindle of its 16″ tool room lathe (it can also be used as a seagoing lathe) on Timken bearings in a semi-flexible mounting to insure accuracy under varying conditions of speed, temperature and loading.



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